Issue #302

OUR 25th ANNIVERSARY YEAR!

November 1985
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73 for Radio Amateurs

A CWC/P Publication

International Edition

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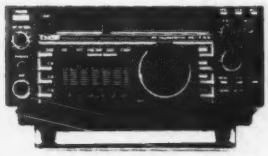

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- A patch should work with any radio. AM, FM, ACSB, relay switched or synthesized.
- Patch performance should not be dependent on the T/R speed of your radio.
- Your patch should sound just like your home phone.
- There should not be any sampling noises to distract you and rob important syllables. The best phone patches do not use the cheap sampling method. (Did you know that the competition uses VOX rather than sampling in their $1000 commercial model?)
- A patch should disconnect automatically if the number dialed is busy.
- A patch should be flexible. You should be able to use it simplex, repeater aided simplex, or semi-duplex.
- A patch should allow you to manually connect any mobile or HT on your local repeater to the phone system for a fully automatic conversation. Someone may need to report an emergency!
- A patch should not become erratic when the mobile is noisy.
- You should be able to use a power amplifier on your base to extend range.
- You should be able to connect a patch to the MIC and EXT. speaker jack of your radio for a quick and effortless interface.
- You should be able to connect a patch to three points inside your radio (VOL high side, PTT, MIC) so that the patch does not interfere with the use of the radio and the VOL. and SQ. settings do not affect the patch.
- A patch should have MOV lightning protectors.
- Your patch should be made in the USA where consultation and factory service are immediately available.

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With a flick of the new connect switch you can patch your friends on the repeater into the phone system. One of them may need to report an emergency!

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The new CW ID keeps you completely informed as to patch status. ID occurs when you access and again when you disconnect. ID is also sent after toll call attempts, all automatic disconnects, manual disconnect and when timeout is imminent. And of course your CW ID chip is free.

PRIVATE PATCH III does not interfere with the normal use of your base radio. A new audio pre-amp permits audio take off before the VOL. control. As a result, the VOL. and squelch settings do not affect patch operation. Of course you can also connect PRIVATE PATCH III to the MIC and EXT speaker jacks as before.

A new digit counting system makes the toll restrict positive even in areas where you do not have to dial "1" first. A secret five digit code disables the toll restrict for one toll call. Re-arm is automatic.

Additional new features: MOV lightning protection — Three digit access code (eg.*93) — Spare relay position on board — Plus former features: 3/6 minute timeout timer — Digital fast VOX (pat. pend.) — 115 VAC supply — Modular Jack and cord plus much more!

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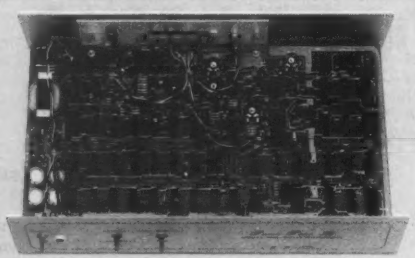

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73® for Radio Amateurs

ISSUE #302 NOVEMBER 1985

On the Cover:
73 columnist Peter Putman KT2B mans contest station K2XR/2 at the summit of Slide Mountain, New York. Photography by Steve Katz WB2WIK.

14 "Just Leave Me Here To Die!"
In June, 1985, two VHF contesters trudged 4200 feet to the top of Slide Mountain. Fifty-pound packs, wet weather, and pernicious porcupines were simply a part of the fun. KT2B

22 Toss Out Your Tubes!
Replace them with high-performance FETs—OA4KO shows you how. OA4KO/YV5

28 Improve Your Audio Report
Are you tired of lying to your fellow amateur? Try the QRI signal reporting system. Let him know what he *really* sounds like. W2OZH

32 Conjure an Rf Genie
73's Weekend Special: A 3–22-MHz signal generator/i-f aligner you can build in under two hours. K1BQT

36 Operate OSCAR on 10 Meters?
It's a snap—all you need is this versatile satellite converter! W6IOJ

44 A Gentleman's Antenna
The solution to an age-old problem: How do you fit a 160m wire onto a 40m lot? WA4BLC

46 Probe the Unknown
Looking for an easy way to measure rf? Use the "electric pen," a no-load active probe with real flair! . . . . . Bailey

50 It's a Dangerous Obsession
Growing up and learning about electronics is like driving a car before you can reach the brake pedal. KB4YJ tells how he lived through it. KB4YJ

52 Convert and Converse
Transform your C-64 Basic programs into Hamtext-readable sequential files. WB9AOU, WD9ADZ

4 What?
7 QRX
56 Barter 'N' Buy
56 Contests
60,70,84 Ham Help
61 Special Events
62 Holiday Shopping Guide
70 Fun!
70 Satellites
72 Above and Beyond
74 RTTY Loop
74 Letters
76 New Products
80 Review
84 QSL of the Month
86 *73* International
94 Dealer Directory
94 Propagation
95 List of Advertisers

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WHAT? *News from the Publisher*

Although you won't really realize it, from a printing standpoint this is the first page since our STS-9 issue (March, 1984) that has been late. Mexico earthquake at 7.8. XEs going crazy, especially in Mexico City, successfully getting on the air. Shades of Managua. We will have a full report next month. By the way, unless you've been in a similar wrong place at the wrong time, you have no idea what terror feels like as the earth rolls beneath, underneath your feet.

The reason I held this page in abeyance was to be able to report, hopefully, that the FCC had done something about PRB-1. They did. The gist of it is that local ordinances regarding amateur radio—especially antennas—may now be preempted by the Commission through due process. Another way to put it is this: state and other jurisdictions "must reasonably accommodate amateur communications and represent the minimum practicable regulation to accomplish the purpose of the local authority." Why did we get this done? Because thousands of you wrote letters.

Notes:

1. When was the last time you wrote to your Representative and Senators about amateur radio? Sit down, do it, spend 66 cents in postage, absorb the cost of pencils/pens, paper, and envelopes yourself, but do it! Barry K7UGA does the best he can to help us, but he can only do in Congress what other Senators and Representatives tell him their constituents want. You don't have to say, "I support such-and-such bill." All you need to say is, "I support amateur radio and won't vote for you until you tell me *you do*."

2. My random calls went out to readers this month in Indiana and Oregon. While we're at it, I should explain in more detail my reference last month to a callee overseas who said, "No, wrong number!" I've gotten letters and calls about it. Simply put, this ham who wants to share lives in a place where political and military turmoil has suddenly surfaced. The person ended up on the wrong side of the fence in the nation, and that's why I knew, by his voice, that something was wrong. Moral: You can't even begin to know what some of our overseas friends go through, nor the danger they sometimes find themselves in.

3. What was Wayne's 25th Anniversary present? Well...even though CW Communications/Peterborough (*73*) and Wayne Green Enterprises (W2NSD) are totally separate divisions of CW Communications, Incorporated...sometimes you get lucky. One night last late winter, I happened to be in one of our other buildings on the other side of town when a CWCP employee who knew me asked what to do with a box of film found in the rafters after remodeling. This was technically CWCP's property but obviously Wayne's personal stuff, so what do I do? I examined it. Here was Wayne's history, in the 50s and 60s, in home 16mm movies...reel after reel.

Eventually, I asked trusted people who have known Wayne for some time whether they thought giving him a great gift was worth more than having him know his privacy had been breached. The answer was yes. As a result, four of us put together an hour-and-a-half VHS videotape.

4. Our Silver Eagle awards last month have brought me great grief, not to mention one possible lawsuit. People say, "Where was *I* in the 98? Where was I in the 37?" Give me a *break, I* say, because we can't recognize everyone. For your information, though, #26 was Jim Kyle K5JKX (1960s) and #27 was Susan Philbrick (1975–Present). I think I'll sneak them Eagles anyway. They are as much 25-year all-stars as anyone else.

Jack Burnett

MPA

73 for Radio Amateurs is a member of the CW Communications/Inc. group, the world's largest publisher of computer-related information. The group publishes 57 computer publications in more than 20 major countries. Nine million people read one or more of the group's publications each month. Members of the group include: Argentina's *Computerworld/Argentina;* Asia's *The Asian Computerworld;* Australia's *Computerworld Australia, Australian PC World, Macworld* and *Directories;* Brazil's *DataNews* and *MicroMundo;* China's *China Computerworld;* Denmark's *Computerworld/Danmark, PC World* and *RUN* (Commodore); Finland's *Mikro;* France's *Le Monde Informatique, Golden* (Apple), *OPC* (IBM) and *Distributique;* Germany's *Computerwoche, Microcomputerwelt, PC Welt, SoftwareMarkt, CW Edition/Seminar, Computer Business, RUN* and *Apple's;* Italy's *Computerworld Italia* and *PC Magazine;* Japan's *Computerworld Japan;* Mexico's *Computerworld/Mexico* and *CompuMundo;* The Netherland's *Computerworld Benelux* and *PC World Benelux;* Norway's *Computerworld Norge, PC World* and *RUN* (Commodore); Saudi Arabia's *Saudi Computerworld;* Spain's *Computerworld Espana, Microsistemas/PC World, Commodore World;* Sweden's *ComputerSweden, Mikrodatorn* and *Svenska PC;* the UK's *Computer Management, Computer News, PC Business World* and *Computer Business Europe;* Venezuela's *Computerworld Venezuela;* the US's *Computerworld, Hot CoCo, inCider, Infoworld, MacWorld, Micro Marketworld, PC World, RUN, 73, 80 Micro, Focus Publications* and *On Communications.*

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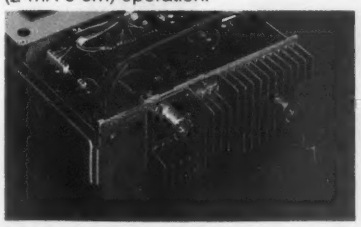
- **Single-function keys allow easy operation.**
- **Large, easy-to-read LCD display.**
  A green, multi-function back-lighted LCD display for better visibility. Indicates frequency, memory channel, repeater offset, "S" or "RF" level, VFO A/B, scan, busy, and "ON AIR." Dimmer switch.
- **Front panel illumination.**
- **10 memories with offset recall and lithium battery backup.**
  Stores frequency, band, and repeater offset. Memory 0 stores receive and transmit frequencies independently for odd repeater offsets, or cross-band (2 m/70 cm) operation.



- **Rugged die-cast chassis.**
- **Two separate antenna ports.**
  Use of separate antennas is recommended. This simplifies antenna matching and minimizes loss. However, mobile installations may require a single antenna. The optional MA-4000 dual band mobile antenna comes with an external duplexer.
- **Programmable memory scan with channel lock-out.**
  Programmable to scan all memories, or only 2 m or 70 cm memories. Also may be programmed to skip channels.
- **Band scan in selected 1-MHz segments.**
  Scans within the chosen 1-MHz segment (i.e., 144.000-144.995 or 440.000-440.995, etc.). The scanning direction may be reversed by pressing either the "UP" or "DOWN" buttons on the microphone.
- **Priority watch function.**
  Unit switches to memory 1 for 1 second every 10 seconds, to monitor the activity on the priority channel.
- **Common channel scan.**
  Memories 8 and 9 are alternately scanned every 5 seconds. Either channel may be recalled instantly.
- **High performance receiver/transmitter.**
  GaAs FET RF amplifiers on both 2 m and 70 cm, high performance monolithic crystal filters in the 1st IF section, provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.
- **Optional "voice synthesizer unit."**
  Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Repeater reverse switch.**

More TW-4000A information is available from authorized Kenwood dealers.

Optional accessories:

- VS-1 voice synthesizer
- TU-4C two-frequency CTCSS tone encoder
- PS-430 DC power supply
- KPS-7A fixed station power supply
- MA-4000 dual band mobile antenna with duplexer
- SP-40 compact mobile speaker
- SP-50 mobile speaker
- MC-42 UP/DOWN microphone
- MC-55 8-pin mobile mic. with time-out timer
- SW-100B SWR/power meter
- SW-200B SWR/power meter
- SWT-1/SWT-2 2 m/70 cm antenna tuners
- PG-3A noise filter
- MB-4000 extra mounting bracket

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
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Antenna mag mount is not Kenwood supplied.

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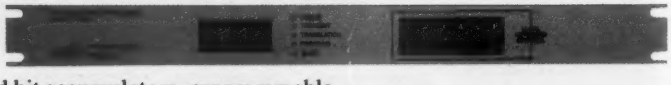
Catch of the day!

Have you been trawling the bounding main for a new product? We have just netted it—the TP-38 microprocessor controlled community repeater panel which provides the complete interface between the repeater receiver and transmitter. Scuttle individual tone cards, all 38 EIA standard CTCSS tones are included as well as time and hit accumulators, programmable timers, tone translation, and AC power supply at one low price of $595.00. The TP-38 is packed like a can of sardines with features, as a matter of fact the only additional option is a DTMF module for $59.95. This module allows complete offsite remote control of all TP-38 functions, including adding new customers or deleting poor paying ones, over the repeater receiver channel.



$595.00 each
$59.95 DTMF module

Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and is shipped fresh daily. Why not set passage for the abundant waters of Communications Specialists and cast your nets for a TP-38 or other fine catch.

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EDITED BY PERRY DONHAM KW1O

50 Already?

KING HUSSEIN JY1 turns 50 this month, and a two-week celebration has been planned by the **Royal Jordanian Radio Amateur Society.** All Jordanian hams will sign with special prefix JY50 from November 7 to November 21, 1985. Prince Raad Bin Zeid, Chairman of the Royal Society, said, "We decided on a two-week period because propagation has been so bad. With a little luck, JY50 stations should be able to work into most call areas in the world during the two-week window." The King, using the call JY50, will join the 50 active Jordanian hams on 160 through 10 meters, all modes, and on OSCAR 10. A commemorative certificate will be given to European amateurs working 10 JY50 stations; non-European hams must contact 5 to qualify. Send a copy of your log (no QSLs are required) and 10 IRCs or $5.00 to the Royal Jordanian Radio Amateur Society, JY50 Celebration, PO Box 2353, Amman, Jordan.

Take 3

HAMS IN SPACE—AGAIN! As first reported in *73* last July, two German and one Dutch amateur will fly aboard the shuttle *Columbia*, marking the second ham-in-space mission this year. Special call **DP0SL** will be used on board Spacelab during the seven-day flight by **Dr. Ernst Messerschmid DG2KM, Dr. Reinhard Furrer DD6CF, and Wubbo Ockles PE1LFO.** The launch is set for October 30, 1985; ham operation is expected to begin on the third day and continue until twelve hours before touchdown. One important difference that sets this wholly-European mission apart from American ham-in-space efforts is the equipment to be used. Most significant is the fact that the antennas will be mounted on the *outside* of the spacecraft (rather than "making do" with a window-mounted strip). Since the Germans own the flight (NASA is merely providing transportation), the problem of modifying Spacelab to accommodate ham antennas was solved in the planning stages. The transceiver being carried aboard also is quite different from its American counterpart. Built by the Robert Bosch Company, the rig operates in a mode similar to AMSAT-OSCAR 10 mode B, receiving on 437 MHz and transmitting on 145 MHz. Six uplink and four downlink channels are available to the astronauts. The channels are: Ch. 0, 437.125 up, 145.450 down; Ch. 1, 437.175 up, 145.475 down; Ch. 2, 437.225 up, 145.550 down; Ch. 3, 437.275 up, 145.575 down; Ch. 4, 437.325 up; Ch. 5, 437.375 up. Uplink and downlink channels may be selected independently. For example, pair 0/3 would be 145.450 down and 437.275 up. The default pair, covering the bulk of communications during the flight, will be 3/3, or 145.575 down, 437.275 up. If the pileups get out of hand, expect the crew to change their receive frequency at random. Repeater owners whose machines have an output in the range 145.45–145.50 MHz should consider suspending operation during the flight to avoid interference to DP0SL. Two beacon types will be used: The first is a standard beacon signing DP0SL. The second beacon will transmit "CQ DE DP0SL RECORD ON TAPE K," followed by a one-minute period during which calls to the shuttle will be recorded. The Deutscher Amateur Radio Club (DARC) will evaluate the tape after the mission and confirm calls heard with a special QSL. There have been rumors to the effect that the three hams will be taking HF equipment on board, specifically 10- or 15-meter SSB gear, in order to study HF propagation conditions from space. Your best source of up-to-date information will be the *73* RBBS at (603)-924-9809.

Hello, Test

IT'S CONTEST SEASON again. Time to gear up for Sweepstakes, the EME competitions, and *of course* the annual **73 World SSB Championships** in January. You'll find the results of the 1985 40-meter contest in this issue, along with dates and times for the 1986 tests and a sample log sheet. Also, note this important change: There is a new central address to obtain rules and entry forms from. Send an SASE to Contest Rules and Forms, Billy Maddox KA6JJK/3, 1162 Bayview Vista Drive, Annapolis MD 21401.

Fine With Me

THE FCC IS busily handing out fines for illegal operation. In Philadelphia, fines totalling $900 were levied on **Joseph Roberson** for operating a CB radio in excess of the legal output limit of 4 Watts. Numerous TVI complaints from neighbors caused FCC engineers to look into the matter. Interestingly, Roberson has refused to allow his CB station to be inspected. Also in Philly, **Harry Jackson** was fined $750 for interfering with local television reception for a period of about 6 months. The FCC says that Jackson's CB radio was operating at 47 Watts output. In Michigan, two individuals had criminal complaints filed against them for allegedly making illegal amateur-radio transmissions. **Glenn Barrick and Richard Szabo,** if convicted of violation of Federal law, could face a maximum sentence of one year in prison and a $10,000 fine for deliberately interfering with amateur communications. **Clinton Berger** of Ridgetop, Tennessee, has been issued a fine of $1,000. Berger, located by the FCC's HF direction-finding network, is accused of illegal operation near 6930 kHz. This frequency is a hangout for the so-called "Oscar Group," a net of ne'er-do-wells that the FCC is trying to shut down. Commission enforcement officers are also looking at "Oscar Group" activity in Indianapolis and San Francisco.

They CARE

A NATIONAL VEC GROUP was formed as a result of an informal meeting of sixteen VECs in Gettysburg, Pennsylvania. The Coordinators were present for an all-day session with the FCC which essentially completed the transfer of amateur licensing into the hands of the volunteer force. As is often the case, a Friday-night "wind-down" meeting produced the most concrete results—a formal organization of Volunteer Examiner Coordinators known as CARE (Coalition of Amateur Radio Examiners). CARE will address the special problems of VECs such as universal accreditation of Volunteer Examiners, developing a common exam pool, and closer cooperation in examination scheduling. Officers picked at the meeting were **Joe Ingram K4OOV, President, Alex Magocsi WB2MGB, First Vice-President, Fred Maia W5YI, Vice-President, Jim Georgias W9JUG, Executive Vice-President, and Gordon Girton W6NLG, Secretary/Treasurer.** Membership in CARE is open to any FCC-accredited VEC, and to any individual Volunteer Examiner. You can get complete information about CARE by contacting Joe Schroeder W9JUV, Box 406, Glenview IL 60025.

Trivia

DID YOU KNOW that the very first man in space was a ham? It was April of 1961; cosmonaut **Yuri Gagarin UA1LO** made a complete orbit of the planet in a trip that lasted a little under two hours. Did Yuri think about amateur radio as he circled in his tiny *Vostok* capsule? Perhaps so. It is interesting to take note of other "firsts" logged by the Soviets in space: the first orbital flight exceeding 24 hours in duration,

first flight by a crew not wearing pressure suits, first woman in space (in 1963—it would be another 20 years before the first US woman would fly), and the first space walk. Oh, yes, and the first amateur-radio satellite to be launched through the garbage disposal of an orbiting space station! And speaking of satellites, congratulations to **Tom Clark W3IWI** who was honored by AMSAT at the 1985 Central States VHF Conference in Tulsa. Tom spent four tough years as president of AMSAT. Those four years saw the catastrophic loss of the first Phase-3 satellite in the Indian Ocean, and the subsequent success of its replacement, AMSAT-OSCAR 10. In recognition of his extraordinary contribution to the amateur satellite program, Tom was given the title **President Emeritus** of AMSAT. Well-earned, we think.

Mixed Groups

"YES AND NO" is the word from the FCC regarding Advanced-class amateurs administering 13-wpm code tests. **Fred Maia W5YI** had asked the Commission to review an earlier Order which dismissed a petition containing changes to the volunteer examination program, including a provision allowing Advanced ticket holders to give the 13-wpm test to General-class aspirants. In dismissing the entire petition, Maia held, the FCC acted contrary to the law. Specifically, Fred claimed that Advanced hams *are* in fact legally able to give the exam, and that allowing them to do so would greatly increase the availability of volunteer examinations. The Commission's decision? "Upon further review, we agree. The statute states that the standard to be applied is whether the examiner is of a higher class than the class for which the examination is being conducted." But, "It appears that the amateur community has risen to the challenge... to administer examinations to over 4,000 applicants each month. This is 50% above the rate...under the previous system and we feel that these volunteers are only beginning to achieve maximum efficiency. Therefore, we will continue to accept the voluntary services of only Amateur Extra operators for administration of Element 1(B) for the General Class license at this time." Yes, and no.

Leaky Lines?

HAMS EXPERIENCING INTERFERENCE from leaky cable-television lines can learn a lesson from the **Chautauqua Countywide Repeater Association (NY)**. Complaints to the New York State Commission on Cable Television resulted in two cable operators voluntarily cleaning up their systems. A third company, however, was forced by the Commission to take appropriate actions to resolve the problem. Leakage from this company's lines was so severe that the only solution, short of discontinuing service, was to begin a massive rebuild of the entire distribution system! Part of the evidence submitted by the CCRA was a map pinpointing leaks along the line, complete with measurements. A total of 113 rf leaks were identified in a small portion of the cable system, ranging from 24 to 4,575 microvolts per meter (the allowable limit set by the FCC is 20 microvolts per meter). The cable operator denied any leaks and stated, "...we have no signal leakage that would exceed FCC regulations." The CCRA is offering interested hams copies of their complaint letters and information on how they made leakage measurements—send $1.00 to cover postage to the Chautauqua Countywide Repeater Association, PO Box 186, Westfield NY 14787-0186.

Good Buddies

CB-TO-TEN conversions seem to be the "in" thing these days! Lately our mail room has been flooded with letters requesting information on how to convert CBs to 10-meter service, and the office telephone has become a "conversion hotline." It seems that a number of surplus dealers are unloading Hy-Gain CB boards at bargain prices and mentioning that *73* would be happy to provide all of the conversion details. And the hams who already *have* old CBs are dusting them off. So here's the deal: We've put together a list of all of the CB-to-10 articles that have appeared in *73* (there are about thirty). Send us an SASE and we'll send you the list. Pick the article you'd like to see and send *another* SASE, and we'll send you a copy of the article. Now, we usually get a fistful of dollars for reprints, but if *you* won't tell, *we* won't tell! Send your SASE to *73* Magazine, Editorial Offices, 80 Pine Street, Peterborough NH 03458, Attn: CB-to-10.

Packet Panic!

PACKET RADIO is experiencing a tremendous growth surge here in the States and abroad. On the West Coast, **Ron Raikes WA8DED** has developed a program which replaces the software in a TAPR-I TNC. The new code is smaller and is designed to allow simultaneous connections to four stations. It also provides routing information on incoming packets, eliminating the need to use the pesky TRACE mode when deciding on a connect path. On the East Coast, high-speed UHF linking between Packet Bulletin Board Stations (PBBSs) is moving ahead at a rapid pace. Overseas hams are embracing packet radio, and PBBSs designed by **Hank Oredson W0RLI** are springing up on HF, providing local 2-meter groups access to the international packet community. The price of packet has dropped dramatically in the past few months with the introduction of the Kantronics Packet Communicator and the AEA PK-64 (both retail for around $200), and every day sees another group of first-time packeteers on the local circuits. Automatic mail forwarding has become commonplace—a message filed in New England can arrive at its destination in California in under an hour. How long will it be before the National Traffic System is replaced? Of course, packet radio is just *one* of the varied modes of communication we amateurs enjoy, and it will never oust CW or SSB, but it *is* the most exciting thing to happen to ham radio since the audion!

Beacon Begins

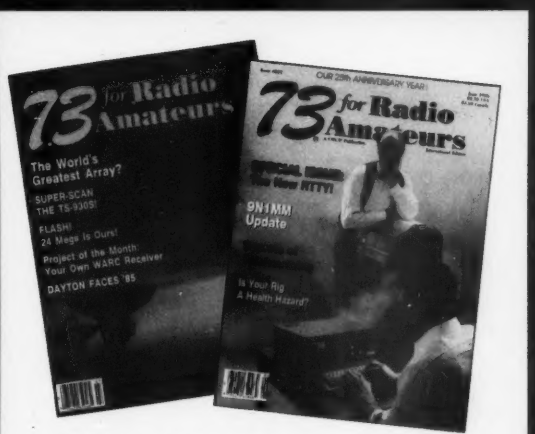
A NEW TEN-METER BEACON is on the air from Thomasville, Georgia. **John Mahagan WB4JHS** is conducting a propagation study in which the height of the transmitting antenna is varied. The beacon runs 7 Watts on 28.253 MHz. Send reception reports to John Mahagan WB4JHS, 220 Covington Avenue Apt. 73, Thomasville GA 31792.

SARSAT Search

HAMS IN WESTCHESTER COUNTY NY were scrambled into action when **Sal Lagonia N2EQM**, Director of Emergency Services for the Westchester Civil Air Patrol, received word that an ELT (Emergency Locater Transmitter) had been activated in his area. An ELT is a device that is turned on automatically when an aircraft crashes—the signal from it is picked up by SARSAT (Search And Rescue SATellite) and relayed to Scott Air Force Base in Illinois. Officials at Scott then notify the appropriate CAP unit. Lagonia immediately dispatched a CAP airplane equipped with direction-finding (DF) gear which narrowed the search to the area around one town. Then, two cars armed with DF receivers and hams were sent out—the first manned by **Dwight Smith N2FMC**, and the second carrying **Bob and Sarah Wilson, N2DVQ and N2EYX.** The two mobiles kept in touch with each other and with CAP headquarters on two meters. In just a few hours, the ELT was located inside a building. It had been aboard a helicopter which had made a rough landing—the pilot thought that removing the unit would deactivate it. It didn't.

Gracias!

THIS MONTH'S COLUMN had help from *The W5YI Report, The ARRL Letter, Gateway, Westlink,* and AMSAT. Do you have news that should appear in "QRX"? Send it (with photos!) to *73* Magazine, Editorial Offices, 80 Pine Street, Peterborough NH 03458, Attn: QRX.

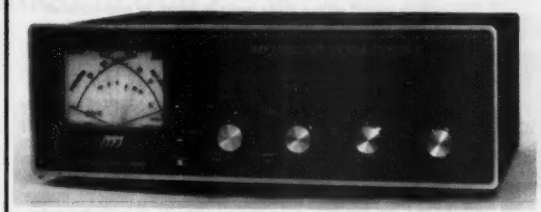


The Gift that Arrives with Frequency

Look
for our Special
Holiday
Offer!

NEW FROM MFJ

MFJ'S BEST 300 WATT TUNER NOW GIVES YOU A CROSS-NEEDLE METER THAT READS SWR, FORWARD AND REFLECTED POWER — ALL AT A GLANCE.



MFJ-949C
$149.95

MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free snack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

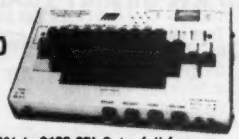
A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 1000 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

SUPER KEYBOARD

MFJ-496
$169.95



Price slashed 50% to $169.95! Get a full feature Super Keyboard that sends CW/RTTY/ASCII for the price of a good memory keyer.

You get the convenience of a dedicated keyboard—no program to load—no interface to connect—just turn it on and it's ready to use.

This 5 mode Super Keyboard lets you send CW, Baudot, ASCII, use it as a memory keyer and for Morse Code practice. You get text buffer, programmable and automatic message memories, error deletion, buffer preload, buffer hold.

A 256 character keyboard buffer gives you perfect CW even if you "hunt and peck". A meter reads CW speed and buffer remaining. 4 message memories lets you store up to 256 characters. 4 preprogrammed messages lets you send CQ CQ DE, CQ TEST DE, DE, QRZ. Has speed weight, tone and volume pots that remembers their settings even after power is turned off. Send 60 WPM Baudot and 100 baud ASCII.

You can use it as a deluxe full feature memory keyer that has automatic and programmable memories, iambic operation, dot-dash memories. Has random and pseudo random code generator.

Automatic serial numbering, message repeating, tune switch, shielded for RFI. 12 VDC or 110 VAC with MFJ-1312, $9.95. 12 x 7 x 3½ inches.

CROSS-NEEDLF SWR/WATT METER

MFJ-815 $59.95

MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power —all at a single glance! SWR is automatically computed —no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter. Needs 12 V. ±10% full scale accuracy. 6½ x 3¼ x 4½ inches.

2 KW COAX SWITCHES

MFJ-1702
$19.95

$29.95 MFJ-1701

Instantly select any antenna or rig by turning a knob. Organizes coax cables and eliminates plugging and unplugging. Unused terminals are grounded to protect your equipment for stray RF, static and lightning. 2 KW PEP, 1 KW CW. For 50 to 75 ohm. Negligible loss, SWR, and crosstalk gives high performance. SO-239s. Convenient desk or wall mounting.

MFJ-1702, $19.95. 2 positions. Cast aluminum cavity construction gives excellent performance up to 500 MHz with better than 60 dB isolation at 450 MHz. Heavy duty, low loss switch has less than 20 milliohm contact resistance, less than 0.2 dB loss and SWR below 1:1.2. 2 x 2½ x 1 inches.

MFJ-1701, $29.95. 6 positions. White markable surface for recording ant. positions. 8½ x 1¼ x 3 in.

ANTENNA CURRENT PROBE MFJ-206 $79.95

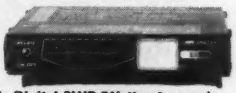
This new breakthru MFJ Antenna Current Probe lets you monitor RF antenna currents—no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **Indicate transmission line radiation** due to high SWR, poor shielding or antenna unbalance.
- **Detect re-radiation** from rain gutters and guy wires that can distort antenna field patterns.
- **Detect RF radiation** from ground leads, power cords or building wiring that can cause RFI.
- **Determine if ground** system is effective.
- **Pinpoint RF leakage** in shielded enclosures.
- **Locate the best place** for your mobile antenna.
- **Use** as tuned field strenght meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strenght meter. 4 x 2 x 2 inches.

DIGITAL SWR/WATTMETER

MFJ-818
$89.95



Fully automatic Digital SWR/Wattmeter reads SWR 1:1 to 1:9.9 directly and instantaneously—no SWR knob to set. Huge 0.6 inch bright orange digits make across-the-room reading easy. 12 segment LED bar graph wattmeter gives instantaneous PEP readings up to 200 watt RF output.

Good, bad, mismatch tri-color LEDs indicate SWR conditions. Small size (5½ x 4¼ x 1 in.) and easy-to-read digital display makes it ideal for mobile use. For 50 ohm systems. 1.8-30 MHz 12 VDC or 110 VAC with MFJ-1312, $9.95.

MOBILE ANTENNA MATCHER

MFJ-910 $19.95

Lower your SWR and get more power into your mobile whip for solid signals and more QSOs.

Your solid state rig puts out more power and generates less heat. For 10-80 meter whips. Easy plug-in installation. Complete instructions on how best to lower SWR. Fits anywhere, 2½ x 2½ inches.

TRIPLE OUTPUT LAB POWER SUPPLY MFJ-4002 $149.95

Triple output lab quality power supply gives you plenty of voltage and current for all your analog and digital circuits. You get **3 completely isolated outputs:** 2 variable 1.5-20 VDC at 0.5 amp and a fixed 5 VDC at 1 amp. Connect in series or parallel for higher voltage and current. It's short circuit protected, has excellent line (typically 0.01%/V) and load regulation (typically 0.1%). **2 lighted 3 inch precision meters** monitor voltage and current simultaneously. It's ruggedly built so you'll get many years of trouble free service. 12 x 3 x 6 inches. 110 VAC with safety ground.

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NEW FEATURES

MFJ's fastest selling tuner packs in plenty of new features!
- **New Styling!** Brushed aluminum front. All metal cabinet.
- **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.
- **New Antenna Switch!** Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.
- **New airwound inductor!** Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 watts RF power output. Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines. Built-in 4:1 balun for balanced lines. 1000V capacitor spacing. Black. 11x3x7 inches. Works with all solid state or tube rigs. Easy to use, anywhere.

RTTY/ASCII/CW COMPUTER INTERFACE

MFJ-1224 **$99.95**

Free MFJ RTTY/ASCII/CW software on tape and cable for VIC-20 or C-64. Send and receive computerized RTTY/ASCII/CW with nearly any personal computer (VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, etc.). Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 170, 425, 850 Hz) and any speed (5-100 WPM RTTY/CW, 300 baud ASCII). Sharp 8 pole active filter for CW and 170 Hz shift. Sends 170, 850 Hz shift. Normal/reverse switch eliminates retuning. Automatic noise limiter. Kantronics compatible socket plus exclusive general purpose socket. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

RX NOISE BRIDGE

Maximize your antenna performance! **$59.95** MFJ-202B

Tells whether to shorten or lengthen antenna for minimum SWR. Measure resonant frequency, radiation resistance and reactance.

New Features: individually calibrated resistance scale, expanded capacitance range (±150 pf). Built-in range extender for measurements beyond scale readings. 1-100 MHz. Comprehensive manual. Use 9 V battery. 2x4x4 in.

INDOOR TUNED ACTIVE ANTENNA

NEW! IMPROVED! with higher gain

"World Grabber" rivals or exceeds reception of outside long wires! Unique tuned Active Antenna minimizes intermode, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Telescoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 in. Uses 9V battery, 9-18 VDC or 110 VAC with adapter, MFJ-1312, $9.95. MFJ-1029A **$79.95**

POLICE/FIRE/WEATHER 2 M HANDHELD CONVERTER

Turn your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner! **$39.95** MFJ-313

144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA maritime coastal plus more on 160-164 MHz. Converter mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts). Use AAA battery. 2¼x1½x1½ in. BNC connectors.

MFJ/BENCHER KEYER COMBO

MFJ-422 **$109.95**

The best of all CW worlds- a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! MFJ Keyer - small in size, big in features. Curtis 8044-B IC, adjustable weight and tone, front panel volume and speed controls (8-50 WPM). Built-in dot-dash memories. Speaker, sidetone, and push button selection of semi-automatic/tune or automatic modes. Solid state keying. Bencher paddle is fully adjustable; heavy steel base with non-skid feet. Uses 9 V battery or 110 VAC with optional adapter, MFJ-1305, $9.95.

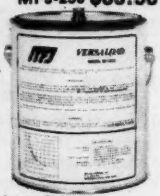
VHF SWR/WATTMETER

MFJ-812 **$29.95**

Low cost VHF SWR/Wattmeter! Read SWR (14 to 170 MHz) and forward/reflected power at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.

1 KW DUMMY LOAD

MFJ-250 **$39.95**



Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP. VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

24/12 HOUR CLOCK/ID TIMER

MFJ-106 **$19.95** *NEW*

Switch to 24 hour UTC or 12 hour format! Battery backup maintains time during power outage. ID timer alerts every 9 minutes after reset. Red LED .6 inch digits. Synchronizable with WWV. Alarm with snooze function. Minute set, hour set switches. Time set switch prevents mis-setting. Power out, alarm on indicators. Gray and black cabinet. 5x2x 3 inches. 110 VAC, 60 Hz.

DUAL TUNABLE SSB/CW/RTTY FILTER

MFJ-752B **$99.95**

Dual filters give unmatched performance! The primary filter lets you peak, notch, low pass or high pass with extra steep skirts. Auxiliary filter gives 70 db notch, 40 Hz peak. Both filters tune from 300 to 3000 Hz with variable bandwidth from 40 Hz to nearly flat. Constant output as bandwidth is varied; linear frequency control. Switchable noise limiter for impulse noise. Simulated stereo sound for CW lets ears and mind reject QRM. Inputs for 2 rigs. Plugs into phone jack. Two watts for speaker. Off bypasses filter. 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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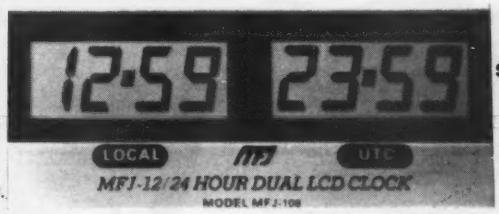

MFJ-108 $19.95

MFJ-107 $9.95

MFJ-24 HOUR LCD CLOCK
MODEL MFJ-107

These MFJ 24 hour clocks make your DXing, contesting, logging and SKEDing easier, more precise. **Read both UTC and local time at a glance with the MFJ-108, $19.95,** dual clock that displays 24 and 12 hour time simultaneously. Or choose the **MFJ-107, $9.95** single clock for 24 hour UTC time.

Both are mounted in a brushed aluminum frame, feature **huge easy-to-see 5/8 inch LCD numerals** and a sloped face that makes reading across-the-shack easy and pleasant.

You can read hour, minute, second, month and day and operate them in an alternating time-date display mode. You can also **synchronize them to WWV** for split-second timing. Both are **quartz controlled** for excellent accuracy.

They are **battery operated** so you don't have to reset them after a power failure, and battery operation makes them suitable for mobile and portable use. Long life battery included.

MFJ-108 is 4½x1x2 in. MFJ-107 is 2¼x1x2 in.

RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE MFJ-1229 $179.95

Everything you need is included for sending and receiving RTTY/ASCII/CW on a Commodore 64 or VIC-20 and your ham rig. You get MFJ's most advanced computer interface, software on tape and all cables. Just plug in and operate.

The MFJ-1229 is a general purpose computer interface that will never be obsolete. An internal DIP switch, TTL and RS-232 ports lets you adapt the MFJ-1229 to nearly any home computer and even operate AMTOR with appropriate software.

A crosshair "scope" LED tuning array makes accurate tuning fast, easy and precise.

You can transmit both narrow (170 Hz) and wide (850 Hz) shift while the variable shift tuning lets you copy any shift (100-1000 Hz) and any speed (5-100 wpm, 0-300 baud ASCII).

Automatic threshold correction and sharp multi-pole active filters give good copy under severe QRM, weak signal and selective fading.

There's an FM (limiting) mode for easy trouble-free tuning that's best for general use and an AM (non-limiting) mode that gives superior performance under weak signals and heavy QRM.

A handy Normal/Reverse switch eliminates re-tuning while checking for inverted RTTY.

An extra sharp 800 Hz CW filter really separates the signals for excellent copy.

12½ x 12½ x 6 inches. Uses floating 18 VDC or 110 VAC with MFJ-1312, $9.95.

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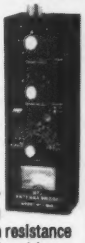
MFJ's Portable Antenna lets you operate 40, 30, 20, 18, 15, 12, 10 meters from apartments, motels, camp sites, vacation spots, any electrically clear location where space for full size antenna is a problem.

A telescoping whip (extends 54 in.) is mounted on self-standing 5½ x 6¾ x 2¼ inch Phenolic case. Built-in antenna tuner, field strenght meter. 50 feet coax. Complete multi-band portable antenna system that you can use nearly anywhere. 300 watts PEP.

MFJ-1621 $79.95

MFJ ANTENNA BRIDGE MFJ-204B $79.95



Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge that you can take to your antenna site—no other equipment is needed.

You can determine if your antenna is too long or too short, measure its resonant frequency and antenna resistance to 500 ohms. It's the easiest and most convenient way to determine antenna performance available today to anyone. There's nothing else like it and only MFJ has it. Built-in resistance bridge, null meter and tunable oscillator-driver (1.8-30 MHz). Uses 9 V battery. 4 x 2 x 2 inches.

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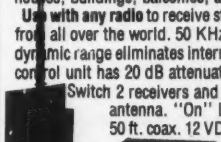
The authoritative "World Radio TV Handbook" rates the MFJ-1024 as "a first-rate easy-to-operate active antenna ... Quiet. with excellent dynamic range and good gain ... Very low noise factor ... Broad frequency coverage ... the MFJ-1024 is an excellent choice in an active antenna".

54 inch remote active antenna mounts outdoor away from electrical noise for maximum signal and minimum noise pickup. Often outperforms long-wire hundreds of feet long. Mount anywhere-atop houses, buildings, balconies, apartments, ships.

Use with any radio to receive strong clear signals from all over the world. 50 KHz to 30 MHz. High dynamic range eliminates intermodulation. Inside control unit has 20 dB attenuator, gain control. Switch 2 receivers and auxiliary or active antenna. "On" LED. 6 x 2 x 5 in. 50 ft. coax. 12 VDC or 110 VAC with MFJ-1312, $9.95.



MFJ-1024 $129.95

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MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier. Efficient air-wound inductor gives more watts out. 4:1 balun, 5x2x6 in.

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MFJ ELECTRONIC KEYER

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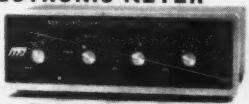

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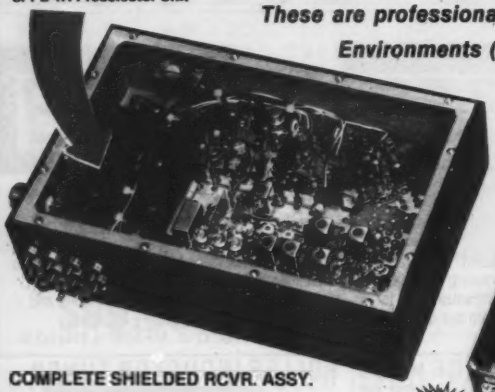

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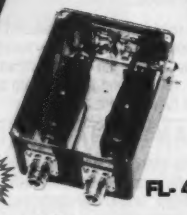

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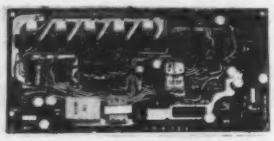

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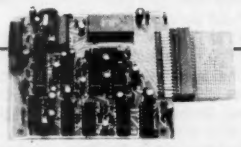

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Options. IC-EX310 speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic, IC-SM6 desk mic, RC-10 external controller, and a variety of filters.

FILTER SPECIFICATIONS

Filter	Model	Center Freq. (KHz)	-6dB (KHz) Width
STANDARD FILTERS			
AM Ceramic	CFW 455 IT	455	6.0
SSB (PBT) XTAL	FL-30	9011.5	2.3
FM Filter	9MI5A	9011.5	15 (-3dB)
SSB Narrow (Hygrade Crystal)	FL-44A	455	2.4
OPTIONAL FILTERS			
CW Narrow	FL-52A	455	0.500
CW Narrow	FL-53A	455	0.250
SSB Wide	FL-70	9011.5	2.8
CW Narrow	FL-32	9010.6	0.500
CW Narrow	FL-63	9010.6	0.250
AM	FL-33	9010.0	6.0

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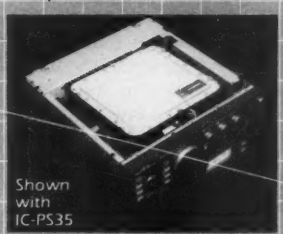
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"Just Leave Me Here To Die!"

In June, 1985, two VHF contesters trudged 4200 feet to the top of Slide Mountain. Fifty-pound packs, wet weather, and pernicious porcupines were simply a part of the fun.

One of the great things about amateur radio is the scope of the hobby: Vast opportunities are open to the adventurous. There's virtually no limit to the ways one can come up with to further enjoy what's got to be one of the most expansive and exciting hobbies in the world. The possibilities are endless: DXing, operating from a boat, plane, car, raft, tent, or even the Space Shuttle, exploring the very high and very low frequencies, home-brewing elaborate equipment, and finding new ways to generate power from portable sources are just a few of the many exotic ways we can get more out of amateur radio.

It was with these thoughts in mind that I began contemplating a somewhat exotic DXpedition in April, 1985. Being an avid VHF/UHF operator and contester, I tried to think of an operation that might make the upcoming ARRL June VHF QSO Party somewhat more "memorable." Since the format of this popular contest had recently gone to using grid-square multipliers (based on the worldwide Maidenhead locator system), it seemed logical that an attempt to put a rare grid square on the air during the contest would be just that type of operation.

After several conversations with area operators and consulting past contest results, it became apparent that there were many grid squares that hadn't been heard from on one or more bands in the past few years. One in particular that stood out was grid square FN22, an area in New York State described by the coordinates between the 42° and 43° latitude lines and the 74° and 76° longitude lines (a grid square, as defined in the Maidenhead system, is 2° wide by 1° high). This area is bounded roughly by the Hudson River to the east, the New York State Thruway to the north, I-81 to the west, and the New York/Pennsylvania border and Catskill Mountains to the south.

This particular grid square manages to miss altogether such densely populated areas as Syracuse, Binghamton, Albany, Schenectady, and Utica, so VHF and UHF activity from FN22 is usually sparse. This lent further weight to my decision since you don't want to be competing against a stronger, better equipped station in your grid if you expect to get a lot of calls on a DXpedition! The only questions left to resolve were what bands to operate on, where to operate them from, and what equipment to use during the operation.

After studying the contest results of the past year, it became apparent that two bands could be considered "scarce" from FN22: 432 MHz and 1296 MHz. In fact, 1296 operation from FN22 is downright rare, since I know of only one other 1296-MHz station there (set up by Joe Reisert W1JR several years ago). The past few VHF and UHF contests have heard no activity from FN22 on this band. 432 MHz has been on from FN22, but usually only during the contest periods. John Lindholm W1XX has put a station on this band during the contests, but many contesters have managed to miss his signal.

Now that the frequencies were decided, the choice of location became paramount. Since FN22 encompasses so many square miles (7107 square miles, to be precise), I certainly had many choices. The most important factor was being near the activity. Experienced VHF/UHF contesters on the East Coast know that this means being near the population belt that stretches from Washington DC all the way up the East Coast to Boston. Traditionally, the top-scoring stations in the various VHF and UHF contests have come from between the Philadelphia area and Connecticut/Massachusetts. I needed to find a suitable spot to be able to work into this belt. It had to

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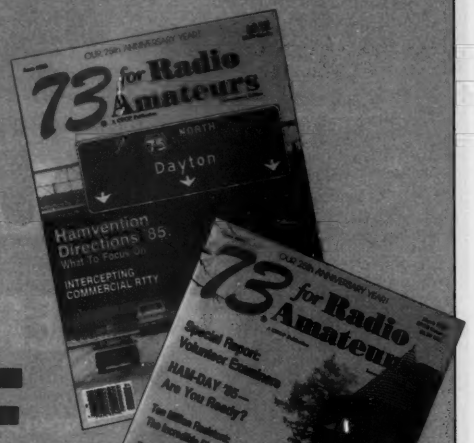

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be high. It had to be accessible by car. And it had to be a short distance from my home location in northern New Jersey.

One particular location was intriguing and kept coming to my attention. In the lower Catskill Mountains stands one of the higher mountains in the Northeast, Slide Mountain, which tops out at 4210 feet above sea level. Nestled in a cluster of somewhat smaller peaks (around 3700–3800 feet), it's very difficult to spot from the ground unless you happen to be by the Ashokan Reservoir on a clear day. Slide Mountain is located on the very southern border of FN22—in fact, the 42° latitude line runs across the south face of the mountain, just below the peak. (How's that for close!) What appealed to me most of all was that a station set up on Slide Mountain would have a virtually unobstructed shot to the east, south, and west, with only a slight shadow to the north/northeast from the northern Catskills.

The decision was made. Slide Mountain would be the DXpedition site. Having been up the mountain earlier in October of 1984, I felt confident that a small, lightweight backpack station could be assembled and brought up by one person. (Would those words come back to haunt me later!) The mountain itself is not accessible by car, but you can drive to the base and negotiate several trails to the top. My previous hike up had utilized the western trail, which begins at 2500 feet above sea level and rises 1700 feet in 2.7 miles of old carriage trail. Not a bad climb with a light bag—just about 1 hour to the top. And what a view! There used to be an observation tower on the mountain years ago. The best view is had by proceeding to the east face at the summit. From here you can drive repeater owners up and down the East Coast crazy with a handie-talkie and a few Watts.

About five years ago, the decision was made by the Catskill Parks Authority and the New York State Department of Conservation to restrict camping and overnight stays in the Catskills above the 3500-foot level. This was intended to curb serious erosion of the tops of many of the popular peaks. I thought long and hard about this rule, since it would put a serious crimp in any overnight operation. Perhaps, I thought, I could arrange a way to stay up, keep warm, and operate without actually setting up a permanent tent site. Of course, campfires were out of the question, so food would have to consist of trail mix and sandwiches. Hot liquids could be brought up in a thermos if needed.

Shortly thereafter, I announced my plan to Steve Katz WB2WIK, who I must say is never short on enthusiasm. He proposed that he come along to lighten the load and to allow a more sophisticated station setup. I quickly agreed, eager for the help and companionship. While we were at Dayton in April, we told as many VHF and UHF operators as we could about the impending trip. Subsequent announcements were made on as many of the East Coast VHF and UHF nets as we could check into, and personal correspondence to area hams played up the operation. After all, we wanted to make sure someone was actually looking for us when we got on the air!

I must admit we met with a little skepticism. The prevailing comment was, "If Slide Mountain is such a great location, why hasn't anyone operated from there in a contest?" Well, that was only partially true, as several stations had indeed been active back in the 60s before the camping restrictions were put into effect. But I insisted that we would persevere and those who looked for us on 1296 MHz would indeed work a rare grid square.

Work proceeded on the station equipment. Steve located and bought two motorcycle batteries, both rated at 12.5 volts and 14 Ah. To test these batteries, he first charged them up and used them to run the exciter on his 2-meter repeater for several days. After a moderate duty cycle, the voltage was found to have dropped to 11.5 volts, which was entirely acceptable. The batteries weighed in at 8 and 10 pounds.

While at Dayton, I visited the VHF Shop booth and after talking with Tom Waldrin KQ3R who runs the store, I decided to invest a couple of hundred dollars into an SSB Electronics 1296 10-Watt amplifier. The drive requirements were .5–.7 Watts at 1296 MHz, which I could supply with no difficulty from a Microwave Modules MMT1296/144 transverter. Ivars Lauzums KC2PX made available to us a Microwave Modules MMT432/144 transverter with 10 Watts of output. It was lightweight and reliable (we thought). Antennas consisted of a 21-element 432-MHz F9FT yagi from the VHF Shop and a 23-element 1296-MHz F9FT yagi I had picked up used. But what to use for masting?

Jerry Meckenberg K2JWE came to the rescue with several pieces of lightweight army masting he had in his garage. Steve selected four pieces of this mast material which weighed about 4 pounds per section, and we drilled the joining sections to allow pinning them together for added security. A South River 3-foot tripod antenna base was selected to hold the masting in place. Coax sections of 30′ each were made up as feedlines, using Belden 8214 on 432 MHz and Belden 9913 on 1296 MHz. Finally, I disconnected the final-amplifier module on my Kenwood TR-9000 so as to save unnecessary drain on the batteries. The output from the driver stage (approximately 50 mW) was sufficient to power both transverters to full rated output without using the supplied 15-dB pads.

Photo A. Pete Putman KT2B loaded up with 70 pounds of equipment. The K2XR/2 expedition up Slide Mountain begins.

A short vacation trip up to Mt. Equinox in southern Vermont over Memorial Day would provide us with a test of the stations. Mt. Equinox is a popular contest site and lies just west of Manchester, Vermont. Topping out at 3850 feet, it offers truly spectacular views in all directions. We had set up several schedules with the folks back in New Jersey on both bands, hoping to make contacts that Sunday morning before we headed back to New Jersey.

Sunday morning came and with it dense rain clouds! Steve got me up at 7:30 am and we headed out to the parking lot. The air

was chilly and wet, but assembly of the masting, antennas, and two stations went quickly. All was going well until we keyed up the 432-MHz Microwave Module and discovered it was only developing 1 Watt of output. This was a strange turn, as the unit had until now been performing flawlessly. Everything else checked out OK—swr, cables, dc power—and we decided what the heck, we'd get on and see what could be worked. Contacts were made in short order with KC2PX, K2JWE, Ralph N2BMN, and others with our pip-squeak power on 432 MHz. We then tried to raise KC2PX on 1296 to no avail, even though all was well on that band. Perhaps the dense clouds were absorbing our signal. Herb K2LNS tried vainly to hear our 10-Watt signal and called a long CQ with his 100 Watts, which we did copy with some difficulty. This proved out our theory of the clouds and storm system playing havoc with the 1296 signal!

After arriving back in New Jersey, the first order of business was to repair the 432-MHz Microwave Module. Unfortunately, Murphy was with us and the unit now refused to put out any power at all! Not only that, a short then developed on the i-f board, rendering the unit useless. Not having adequate documentation on this unit, I shipped it off to Hans Peters VE3CRU for repairs and considered our dilemma. What could we use on 432 that was lightweight and reliable?

A call to Tom KQ3R at the VHF Shop followed. He told me about a 100-mW transverter he had in stock along with a companion 432-MHz 10-Watt amplifier from SSB Electronics. The price sounded reasonable and I traveled out to Mountaintop, Pennsylvania, to meet Tom in person and pick up the two units. The transverter was preassembled (which was a real time-saver) but the amplifier was a kit. Tom assured me it was a quick 2-hour kit and, not one to be afraid of a soldering iron, I took it home and set to work.

Photo B. KT2B trying to stay warm in 50° temperatures while on 432 MHz. Note the modified British Airways headset on the wool cap—lightweight and reliable.

The amplifier did indeed go together quickly, but I was unable to obtain more than 4 Watts of output from it with full drive. Substituting several transistors resulted in more output, but only about 6–7 Watts maximum. The amplifier developed an instability condition and blew two rf chokes as well as the driver. I was convinced that Murphy was indeed wielding his influence over our DXpedition. Finally, a decision had to be made and Steve made it—he modified his KLM Echo 70 432-MHz transceiver to have agc and to accept a Janel 432-MHz GaAsFET preamplifier. It was heavy, but it was all we had left to fall back on—and there were only three days until our trip started! As bad as I felt about taking all that extra weight, I had no choice left.

Friday night found the two of us boxing up supplies, radios, cables, food, and drink. I finished the weigh-in and came up with some distressing news: The total weight would be just over 50 pounds per person! That's not a light load, especially when you haven't gone mountaineering or backpacking in about ten years. The problem was that nothing could be eliminated to reduce the weight load, as we had pretty much cut everything down to the essentials (or so we thought). Two multimode radios, one transverter, one power amp, four mast sections, two antennas, a wattmeter, two batteries, keyers, paddles, phones, two sleeping bags, a tent, two canteens, ponchos, coax, tools, clip leads (essential items), food, clothes, and flashlights comprised our equipment list. Not only that, we managed to stuff just about all of it into two Kelty backpacks.

Saturday, June 8, 1985, dawned cool and rainy. Oh, no—not another repeat of Mt. Equinox! I called Steve and said that, unless it was hailing or severe thunderstorms were raking Slide Mountain, we ought to try it. He agreed, and an hour later we were on our way to the mountain.

A quick stop for a late breakfast at Homer's in Port Jervis allowed us to load up our stomachs and save space for the dinner materials in our backpacks. 90 minutes later we arrived at the base of the mountain, having driven through alternate rainy and sunny weather. It looked like the storm system might break after all! We pulled into a sheltered parking area at the base of the trail and began loading each other up. Let me tell you, 50 pounds may not sound like much, but when it's on your back it feels like 150 pounds! In fact, we both became quickly aware that we had brought more than 100 pounds of stuff with us. The ranger on duty helped us load up and estimated my pack to be close to 70 pounds! Steve's pack weighed in at 50 or more, so our work was definitely cut out for us this morning.

Whatever we couldn't put into the packs we strapped to our backs using elastic stretch cords—God's gift to backpackers. I wound up with the TR-9000, Echo 70, 1296 amp, one battery, flashlight, canteen, tools, food, clothes, sleeping bag, tent, and the two antennas (broken down and wrapped in our ground cloth). Steve carried the 1296 transverter, the other battery, both keyers, paddles, coax, water, thermos, food, tripod, the other sleeping bag, and flashlight. In addition, we both carried two sections of mast material. Photo A shows me loaded up.

We started out minus one canteen and the wattmeter, since room and weight precluded either. Our reasoning was that if the stations didn't work right now, there wasn't anything we could do about it at the top. Also, there is a spring near the top on the east trail, although it's quite a climb if your relatives aren't mountain goats. The trail immediately got rough, with a steep climb up an old stream bed and some rocks in order to join the abandoned wagon trail. At this juncture, 2 miles from our objective, we knew we were in trouble. Both Steve and I were very overloaded. We stripped down to T-shirts and shorts to cool off and

had to make frequent "back breaks" to reduce the strain on our shoulders. Carrying two masts apiece added to our discomfort, since we couldn't use our hands to pull up the back frame and readjust its weight on our backs.

To further complicate matters, it began to rain again. At the lower elevation this wasn't a big problem because the dense tree cover kept us dry. As we started edging closer to the 3000-foot mark, it became quite wet and we were forced to put ponchos on. The going was very slow, and the packs felt like boulders! Steve in particular was getting *very* tired, and not being inclined to be tried for "hamicide," I suggested frequent rest breaks with the packs off. These worked well, except we didn't want to put the packs back on afterwards! Needless to say, we were constantly gulping down the contents of our lone canteen, secure in the knowledge that somewhere up there was a running spring. The trail mix came in handy for energy, but there was no substitute for the rest periods. Steve came up with a novel method of leaning over to put the weight of the pack square on his back and relieve his shoulders. I took to leaning on the two mast sections and propping up my frame. But no amount of this rest would get us to the top, so on we trundled.

It was a great lift to our spirits when we finally reached the 3500-foot level. After all, we had been on the trail for nearly *three hours* and we were beginning to wonder if we'd actually make it to the top. What didn't make us feel so good was the number of hikers that had passed us on the way up and were now coming back down after reaching the top. This was a *slow* journey. Shortly thereafter, we attained the shoulder of Slide Mountain, where we hiked into coniferous trees and out of the rain. What a spectacular view of the Catskills! We took another rest break for 20 minutes and assessed the balance of our trip—about .65 miles. It didn't seem too difficult, since we were now hiking along a very level trail with an occasional slope upwards.

The final leg took nearly 35 minutes to go the .65 miles, as we were both just running out of energy, and it was a welcome relief to see the concrete footings from the old observation tower at the summit. We had dropped the masts about .2 miles back to allow us to use our hands while scrambling up the last few rocks on the trail. I quickly dumped my backpack (my shoulders felt just then like they were full of helium gas) and ran back down the trail to get the masts. Steve collapsed in the clearing I had picked out and took a quick nap. After a scramble to the spring to replenish our water supply, we set to work putting station K2XR/2 on the air.

The mast setup and station connections worked flawlessly. At about 7:45 pm Steve began testing each station to make sure all was working, while I wolfed down some sandwiches and trail mix. Another complication arose in that while the weather had cleared up, it was becoming very cool—in fact, downright cold. Off came the shorts and on went long jeans, a sweatshirt, and a wool hat. (At this time I thought I might be suffering from a mild hypothermic condition—since I felt severely chilled and had not eaten much—so the hat and a pair of gloves came in handy.) Steve felt fine and at 8:00 pm K2XR/2 burst onto the airwaves on 432.110 MHz. I finished my hot chocolate and soup and set about getting on 1296 MHz.

Was this a good site? You betcha! Steve worked 17 stations and 8 grids in the first hour, while I managed to contact 5 stations in 5 grids in the same period. By the way, the latter figure is a very good Q rate for a band that most people only operate on a sked basis! It was especially fun to call CQ on 1296 (unheard of most of the time) and work stations *off the side* of the 23-element beam. W1RIL in Worcester, Massachusetts, was worked in exactly this fashion, as were K3MTK in Pennsylvania and W2SZ/1 in Massachusetts. The air temperature continued dropping, so Steve and I unrolled the sleeping bags to operate from.

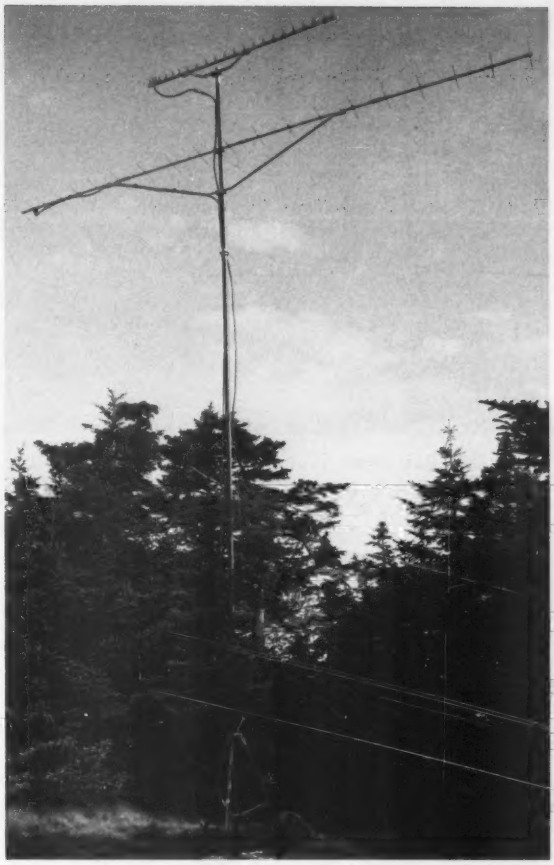

Photo C. The antennas. The mast was rotated using the time-honored "Armstrong" method.

Photo B shows me operating in my "warm" outfit (yes, I could hear the headphones through that wool cap) and Photo C shows the mast which was rotated by hand. What the heck, it was faster than a Ham-M! On and on we went, swinging the beam in all directions. What amazing signals! Jerry K2JWE, who had lent us the mast, was our first contact and he didn't take too kindly to our suggestion of leaving it up there when we came back down! As the evening wore on, the temperature dropped to about 45°, but the skies were crystal clear. An amateur astronomer would have a ball on Slide Mountain with a good telescope. The ranger set up his tent and spent the next hour watching and listening to us working stations, exchanging grids, calling out beam headings, setting up skeds, and operating CW, the latter which he found fascinating.

The QSOs kept coming, although somewhat slower now as the bands died down.

Photo D. WB2WIK on Sunday morning on 432 MHz. The ledge in the rock conveniently holds a paddle and the log. The 1296 station is on the right.

We didn't know that 6 meters had been open all day to the Midwest and South, which kept a lot of stations off the UHF bands. This probably also explains why we didn't hear any stations from Buffalo and Rochester and worked just one from Ottawa. Where was Toronto?

About midnight we decided to pack it in since the bands had pretty much been milked dry. Many stations were excited to work us on 432 and others were ecstatic to have finally bagged FN22 on 1296. My last few contacts, including K1PXE, N2BJ, and WA2FGK, were made from *inside* the sleeping bag with paddle and mike. At this point, we had worked 46 stations and 11 grid squares on 432 MHz, and 15 stations and 7 grid squares on 1296. Impressive totals for 4 hours of work with 10 Watts. We decided to hit the sack and get up early to make a few more contacts. But the porcupines had other ideas.

I spent the better part of the night chasing porcupines away from our site, for these ornery little devils like to chew on anything, and I mean *anything* they can get their teeth into. At various times throughout the night, they tried to chew on the 9913 cable, my gloves, the transverter, a flashlight, Steve's bag, the batteries, and our canteen. The best method to repulse them was a large stone thrown at their backsides. But as soon as I fell asleep, they returned and lit into something else. About 4:30 am I found out that "something else" was the nylon webbing on Steve's backpack, which had been nearly chewed through! A few large boulders chased them off again (there were at least seven or eight around us at all times) and by then the sun was starting to come up, so I gave up thoughts of getting any sleep. The ranger came by about 4:45 and we talked for a short while about the various methods used to chase off the porcupines, including the heavy-rock method, which he heartily endorsed. He claimed he had seen one eat through a tin can and swallow it, which I didn't doubt for a minute considering what damage had been done to the backpacks.

Steve had completely zipped up his bag in a mummy position and rolled off the rock into the trees, but the conversation and sunlight soon woke him up and we watched a truly beautiful sunrise. Breakfast was in order, and out came the thermos of hot chocolate and soup. Today's special was peanut butter and jelly sandwiches with (you guessed it) trail mix. The bags were rolled up and by 6:20 am we were back on the air. Photo D shows Steve hard at work making contacts on 432, and he looks like he just sat on one of the visitors from the night before.

The contacts came slowly but picked up after about a half hour. We were able to work another 14 stations and 2 new grids in 2 hours on 432, while 1296 yielded 4 new stations but no new grids. We finally worked a VE (VE3FN) on 432 and got into FM19 in Maryland and Virginia. But the low clouds from the day before persisted, leading us once again to think that moisture absorption was working against us.

Finally, at about 8:30 local time, we decided to start packing up and head down the mountain. Our decision was aided by an invasion of the largest swarm of black flies I've seen on a mountain. Out came the Cutters! The flies clustered on our damp clothes which were hanging on a guy rope, and hitting the clothes with a rock caused a black cloud to rise into the air. The ranger stopped by to say good-bye and headed down the mountain. It actually took us from 8:30 till 10:00 am to get ready to head out. Perhaps this was because we didn't relish the thought of having to carry all that weight again. Using up some of the food helped, as did emptying the thermos, but the bulk of the weight was still there—in the batteries, the multimode radios, the flashlights, and those blasted mast sections. It didn't look like an easy descent.

We were pleasantly surprised to see how easy it was going down. After all, gravity and Mother Nature were on our side this time and Murphy was nowhere to be found! We were able to cover the 2.7 miles down in just over 2 hours, *half* the time it took us to get up to the top. We arrived at the car at 12:15 pm and I was surprised when I opened it to find another canteen full of *cold* water. Shower time! Steve had fallen back a bit but appeared from the woods about 10 minutes later, got to the car, and toppled majestically onto the tailgate (pack and all) with the words *"Never again!"* After a short repacking period to secure the batteries so they wouldn't spill, we headed back to civilization and a lunch of hamburgers, hot dogs, onion rings, and *beer.*

In retrospect, I'd have to call the DXpedition a success, since we *did* achieve our objective, which was to operate from the top. We were both disappointed that there wasn't more activity that we could hear on the UHF bands (and I'm sure the 6-meter propagation caused a lot of that), but it was impressive to call CQs on 1296 and work stations with beam headings 90° away. Try *that* from your home sometime on the UHF and microwave bands! Our injuries were minor: Steve's shoulders and neck required some TLC and I suffered a mild burn from the back strap on my shoulder blade, which some lotion took care of. All the equipment made it back in one piece, although the 1296 antenna broke two elements on the climb down and the 432 antenna bent a few.

Would we do it again? Maybe, although with *more* help since it is a real *climb* when you're loaded down. But it's kind of a nice feeling to realize that you've set a goal for yourself, something that no one else has done, and carried it off. That's what makes ham radio exciting for me. As for Steve? He summed it up at the 3500-foot level on our way up Saturday: "Just leave me here to die."■

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Toss Out Your Tubes!

Replace them with high-performance FETs— OA4KO shows you how.

The purpose of this article is to encourage amateurs to modify all of those vacuum-tube accessories getting dusty in the basement. The general rules recommended here apply very well to any stage using vacuum-tube triodes or pentodes as oscillators or amplifiers. They can be replaced by unijunction FETs almost without circuit modifications. As a bonus you get lower power consumption with better gain, noise-figure, and intermodulation specs. A little bit of theory is explained and an actual modification is described.

This article began back in 1959 in Peru when, one day, I received TV Channel 2 from Cuba and Venezuela. That was the best year for propagation conditions I have ever seen! If Channel 2 was so well received on a normal TV set with an indoor antenna (there was no Channel 2 in Lima at that time), then I supposed that the 6-meter band would be a good choice for DX, too. However, my Novice license kept me out of that band until the early Sixties.

During those days, the most modern transmitter tube available was the 6146, a good tube up to 60 MHz. There were very reliable triodes for VHF receivers, most developed for television sets and featuring a very low noise figure and high transconductance. Many war-surplus goods for VHF were available, too, at very reasonable prices. I talked with experienced fellow amateurs and decided to make a visit to my local radio shop just to see what was available. The visit was discouraging. The best choices were a Globe Scout for a transmitter and the Hallicrafters S-40 for a receiver, but the goods were out of my price range. Fortunately, we were in the "build-it-yourself" days!

The Globe Scout was priced at $119.95 wired, and $99.95 as a kit. This transmitter, marketed by World Radio Laboratories, featured 80-to-6-meter coverage, AM plate modulation, crystal-lized frequency control, 5 tubes (including the new 6146), and a self-contained power supply. If desired, a 6-meter vfo, at $49.95, was available as an accessory, as was a vfo for the HF bands. It furnished a full 65 Watts CW and 50 Watts phone. I still have the brochure I picked up which has the schematic in the back, as was usual with all Globe products. I remember also the Globe Champion, a *de-luxe* transmitter owned by my friend Jose Maria OA4II. This beautiful 300-Watt transmitter was well beyond my price range.

I went back home to digest the information I had gotten at the store. My own transmitter, the Globe Chief, had two 807s for 90-Watt CW and had a screen-grid modulator to go AM. The modulator and vfo were homemade and really worked! I also remember that I built another vfo for Eduardo OA4JR. The 807s allow no operation at 50 MHz, so the Globe Chief was discarded as a candidate for modification. My receiver, a used Hallicrafters S-40, had no 6-meter band

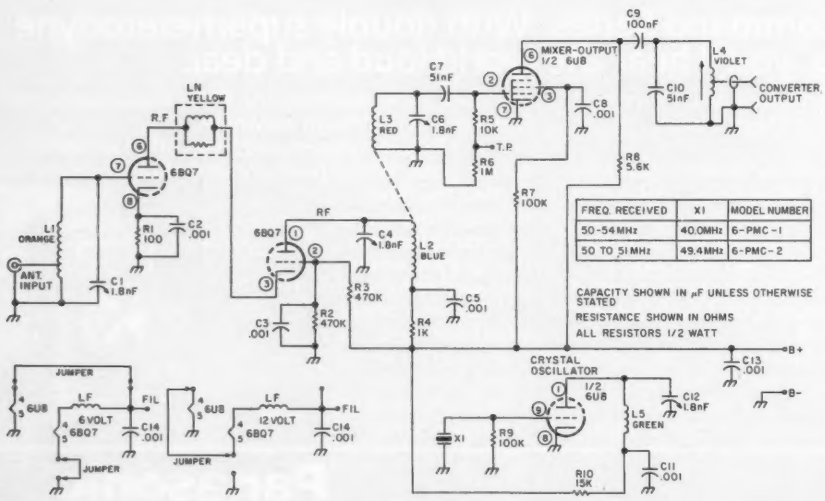

Fig. 1. The original two-tube 6-meter converter.

and the price of the new Hallicrafters S-53A, which covered up to 54 MHz, was prohibitive.

I decided to build a transmitter around the new 6146 tube and to swap a BC348 surplus HF receiver for another surplus VHF receiver. A couple of days later, I met Mark Johnson, the owner of the radio shop, a great man and better friend. He now lives retired in the US but is not a ham any more, for he was not well disposed to learning the code. We talked about my research and he suggested that I buy a converter for my receiver and that I construct the transmitter. That same night we went to the shop and he showed me the converter. It also was a World Radio Laboratories product, the model 6-PMC, and featured two modern tubes—the 6BQ7 (twin triode) and 6U8 (triode/pentode). I hurried home with the converter, connected it to my receiver, and received nothing but noise. An antenna was needed! I cut a dipole and called a friend on forty to run a test. I transmitted on 40 and received on 6 meters—and was treated to the clearest signal I had ever heard in my short life as an amateur. No QSB, no noise, no whistles, just pure AM! I soon had a three-element homemade antenna up, fed by my homemade transmitter, and certainly had the most enjoyable experience in my career as a ham.

Then came SSB, and soon propagation declined. I moved to Brazil and the converter remained on a shelf. Years later, all of my DXing was done on the HF bands using my Heath SB line. Even then, I thought that the converter was a good piece of equipment deserving a revamping. During the late Sixties I always had the intention of modifying it but never did until now.

WRL's 6-PMC

The 6-PMC is a tubed converter developed to be used

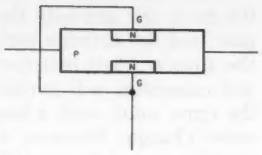

Fig. 2. Construction of a P-channel FET.

with any one of three different i-f frequencies: broadcast band, 10 MHz, or 28 MHz. The unit requires 200 V dc at 15 mA and 12.6 V ac at 850 mA. The antenna input connector is an automobile antenna type, since the equipment was intended to provide both mobile and fixed-station operation. The output is just a piece of coax to be attached to the antenna terminals of the receiver. The modern design (at the time) was developed around a phenolic printed circuit board and mounted in a gray painted aluminum box.

The schematic of the original converter is shown in Fig. 1. As you can see, the circuit is very simple. It has a cascode amplifier, a pentode mixer, and a triode crystal oscillator. The oscillator injection is provided by means of the stray capacitances. This scheme provided a low-noise/high-gain combination with very low intermodulation products. The only problem encountered was that the PCB warped due to the high temperature of the shielded tubes! The tubes were placed with half of their body inside the metal box, hence most of the dissipated heat remained within the enclosure.

What is a FET?

When I decided to modify this unit, the obvious choice was to replace the tubes with FETs. They work very well in place of the triodes and pentodes when used as class-A amplifiers, but they cannot be used as class-B or class-C amps, as will be explained later. The input impedance of a FET is very high, some 10 megohms. It has very low noise, very high gain and excellent intermod response.

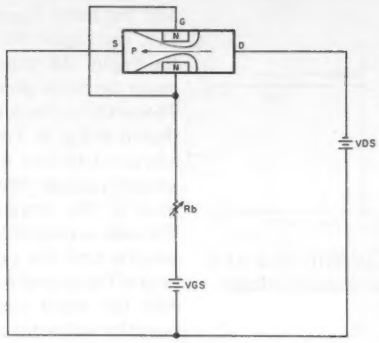

Fig. 3. Current flow in a properly biased P-channel FET.

The replacement of tubes by FETs is very easy to accomplish, but I prefer to review some basics just to have a background that allows you to attempt the modification of simple tubed equipment. This way you will know how it is done and what to do if your equipment is not the Globe converter.

Some Theory

A field-effect transistor, or a FET, is a very simple semiconductor device. It's much simpler than a bipolar transistor since it is just a bar of silicon with a dopant which determines its polarity characteristic. The bar, for example, is of P-type silicon and is shown in Fig. 2. One end of the bar is called the source (S) and the other end is called the drain (D). Midway across the bar there are two small N-type regions which are connected together and are called the gate (G). The portion of the silicon bar between the heavily-doped gate is called the channel. As the bar is of P-type silicon, our FET is called *P-channel*. Should the bar be of N-type silicon, the FET is an *N-channel* device.

As shown in Fig. 3, the current in a P-channel FET flows from the drain to the source through the length of the channel. Right at the junction, a subtle change has taken place—some of the

Fig. 4. Schematic symbols for FETs.

free electrons in the channel have filled some of the holes in the P regions. Therefore, right at the junction, there is a symmetrical crystal structure which forms a barrier and prevents any further combinations of holes and electrons. On either side of the junction, there is a small area without free carriers called the depletion region.

For proper operation, the gate should always be reverse-biased when referenced to the source. The source and the drain are interchangeable in most units if, and only if, the internal geometry is symmetrical. To stay on the safe side, follow the terminal markings and the manufacturer's recommendation. If the FET is a P-channel type, the drain must be connected to the negative side of the power supply and the gate must be positively biased. From a different perspective, the proper polarity of the drain can be determined by thinking of the gate as being shorted to the source. The polarity of the drain should then reverse-bias the junction at the gate drain end. The polarity of the drain, with respect to the source, is then opposite to the polarity of the gate with respect to the source. As shown in Fig. 4, the P-type FET symbol

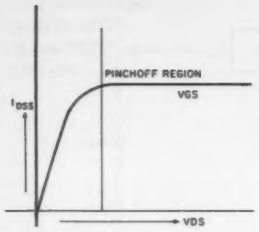

Fig. 5. Current flow as a function of supply voltage.

shows the arrow pointing away from the junction, while the symbol for an N-type has the arrow pointing toward the junction.

As you vary the gate potential, the current flow is also varied. The doping level of the gate is very large compared with the channel; therefore, when the p-n junction is reverse-biased, the depletion region will extend into the channel region. The current flows through the channel linearly as the supply voltage is increased until a pinch-off voltage is reached and the current cannot increase anymore (see Fig. 5). This is caused by the depletion region around the gate which reduces the channel to such an extent that no more current can flow through it. The depletion region has very few carriers, so its conductivity is very low. The result is a reduction of the channel cross section and hence an increase in the channel resistance.

Testing FETs

I_{DSS} is the current passing through the channel when the gate is biased at 0 volts or is just tied to the source. This current reflects the gain and the noise figure of the FET. The higher this current, the higher the gain and the lower the noise generated is. The setup to check the I_{DSS} is shown in Fig. 6. You should always use the drain-to-source voltage that will be used in the actual circuit. The gate is connected to the source and the current is read at the ammeter in series with the drain supply. Record this value for each FET that you have. I will show you later how to use I_{DSS} in an actual design.

FET Behavior

FETs are semiconductor devices and are affected by changes in temperature. The interesting thing is that an increase in temperature *decreases* the current flow—the reverse of a normal bipolar transistor. At the gate, the increase in temperature increases the gate-channel leakage, but this effect is only important when there is a very high resistance in the gate-to-source circuit. Normally, temperature is of no concern in the amateur service unless you install FETs in a very hot environment. In this particular case, temperature is something to be taken into account. However, most FETs will withstand temperatures of up to 150° C if they are properly biased.

Like vacuum tubes, FETs may be used as triodes in common-source, common-gate, and common-drain amplifiers, corresponding to common-cathode, common-grid, and cathode-follower tube configurations. Just replace the plate with the drain, the grid with the gate, and the cathode with the source. Most resistors and capacitors will remain the same value, with a few minor changes. However, it should be noted that the FET *cannot* replace a triode or pentode if the stage is a class-B or -C amplifier. The FET cannot drain current when the gate (grid) is forward-biased, as is normal for half the cycle in class-B or -C amplifiers.

It is important to mention that the noise figure in a FET is quite lower than that of a bipolar transistor or tube. But remember that low noise figures are obtained only with careful circuit adjustment and proper selection of components. Noise is very important at both audio and VHF/UHF frequencies. At HF the high level of atmospheric noise is higher than the noise generated by FETs; however, a low-noise audio amplifier is an advantage in a communications receiver. In this regard, an outstanding combination is a FET product detector and a FET audio amplifier.

In general, any oscillator circuit designed around a triode may be used with a FET. A large gate-to-source resistor should be used to limit the gate current to a safe value, since a FET oscillator does not operate with gate current. When the gate goes forward biased it merely limits the drain-to-source current. Usually, this resistor is already installed in the tube circuit and may have a value near 100k Ohms. The signal amplitude may be controlled either by varying the supply voltage or by varying the source self-bias resistor (see Fig. 6).

As mixers and detectors, FETs are really excellent. Here is where the FET's low noise and freedom from cross modulation is of real value. The best operating point is achieved with a bias equal to half the pinch-off voltage. The drain current will then be 25% of I_{DSS} in static operation (without signal injection). Refer to your list of I_{DSS} values and reserve the units with higher I_{DSS} current for the amplifier stage. Use the second-better units for the mixer stage. Using the same setup as before, place a 10k pot in series with the source and adjust the resistance until the current drops to 25% of original I_{DSS} value (see Fig. 6).

For minimum cross modulation the instantaneous sum of the oscillator and signal voltages should not exceed the pinch-off voltage in low-level mixers with signals in the uV level. When signal levels are higher, like in a second mixer, the oscillator voltage should be reduced, which also reduces the conversion gain. There is a drawback, however: The interelectrode capacitance is very high in FETs and this may cause frequency pulling. The cure is to use an isolation stage.

For product detectors the oscillation injection should be reduced. A choke or high-impedance transformer is used at the drain output to ensure a higher voltage and hence higher current at the drain. The choke or transformer has less dc resistance than a resistor.

When the FET is used as an i-f or rf amplifier, bias the device at ½ I_{DSS}. Not too much gain is lost, mutual conductance is reduced by only 30%, and stability is ensured. The procedure is shown in Fig. 6.

For RC-coupled amplifiers, choose the load and select the bias to drop the voltage across load to half the supply voltage. Use the same setup shown in Fig. 6. The RL is the chosen load and a voltmeter reads the voltage across this resistor. Remember to use the units with higher I_{DSS} for high-gain preamplifiers to get a lower noise figure.

Throw Away Your Tubes!

My first step was to pull

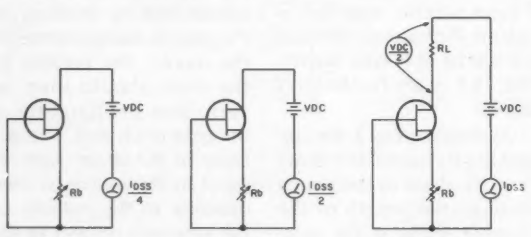

Fig. 6. Three FET circuits.

out the tubes and shieldings in the old converter. Then I picked four 2N3819 FETs I already had. No special choice here, you may use MP-102s or whatever FET is at hand. Use a FET with high I_{DSS} current in the cascode amplifier for better performance. Always use the best FET at the first rf or audio amplifier, as I recommended before.

I replaced the tubes by plugging the FETs into the tube sockets, inserting a FET at pins 6, 7, and 8 of the first tube. Remember that tube pins are numbered from below—pin 1 is the first pin counterclockwise from the alignment gap (viewed from above). I plugged the remaining FETs into both tube sockets. Next, I connected the coaxial output to my Yaesu FRG-7700 antenna input and ran 12 V dc from my regulated power supply to the B+ cable in the converter. I tuned the receiver to 10 MHz and switched on the converter. The noise increased very little and I assumed nothing was wrong. A glance at the schematic and some voltage measurements showed very poor activity of the 40-MHz crystal oscillator. I pulled R10, the 15k resistor connected from the power supply to the plate (now the drain) of the 6U8 triode section, and replaced it with a jumper. I switched it on again and *listo*! TV Channel 2 interference was evident. I quickly tuned around 50.1 MHz but found no amateur activity. I tuned the TV-2 video carrier at 55.25 MHz. It was S9+10 dB. Some tweaking was necessary and after repeaking the i-f coil and adjusting the piston trimmers, the signal went up to S9+20 dB. I tuned in the TV-2 audio carrier at 59.75 MHz and placed my FRG-7700 in FM mode. The sound was crisp and the S-meter showed S9 after readjusting the trimmers. I moved back to 52 MHz and repeaked the trimmers. This time I received a signal, although an undesired one: a pirate station! Well, it was not bad at all for a modification planned more than 20 years ago.

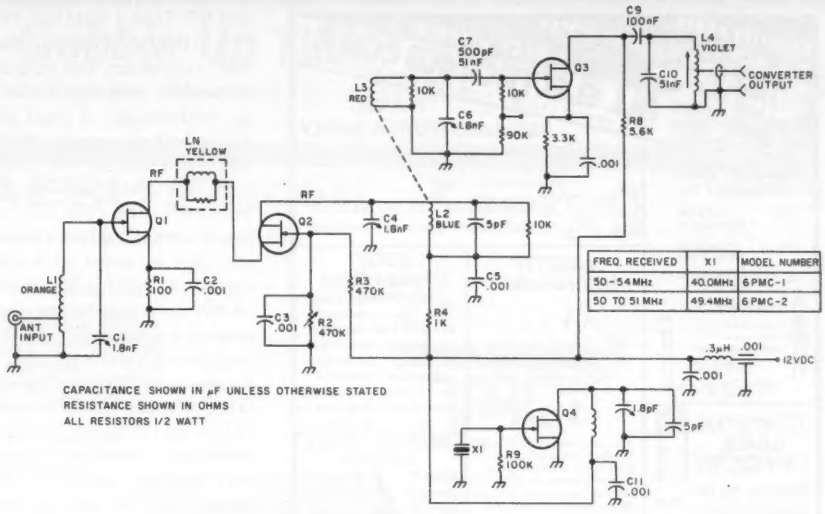

Fig. 7. The new four-FET 6-meter converter.

I desoldered the antenna connector, the coaxial output, and the supply cable. The next step was to remove the four screws securing the PCB by four bronze spacers. The automobile antenna connector was very ugly and hence was discarded. I installed a BNC jack in the same place and an RCA jack on the other side to be used as an output connector. Instead of the power-supply cable routed out of the box through a hole, I installed a 0.001-uF feedthrough to be used as the positive supply terminal and a #6 solder lug secured to the box with a 6-32 × ⅜" screw and nut for the negative supply connection. I also installed a 22-uF tantalum capacitor at the PCB B+ (now +12 V dc) hole and an 8-uH choke for rf filtering. You don't have a choke at hand? Don't worry, a 100-Ohm resistor may be used or just build a choke on a 1-Watt high-value resistor, winding as many turns as you can of number 28 enameled copper wire onto it.

Adjusting the coils while tuned to the TV-2 video carrier showed no improvement in signal strength. I tuned around 52 MHz and adjusted the trimmers for maximum noise. Coil L5 refused to tune even with C12 at maximum capacitance—same thing for C4 and C1. More surgery was necessary.

The two 470k resistors, R2 and R3, form a voltage divider that obviously results in a half-supply bias of around 6 volts. I decided to install a 470k trimmer instead of R2 to allow a bias adjustment. I replaced R6 with a 90k resistor and installed a 3.3k resistor in parallel with a .001-uF capacitor in series with the mixer source. For mixer operation, the FET gate bias should be equal to half the pinch-off voltage, which means a drop of some 25% in drain current. I installed also a 5-pF capacitor in parallel with all of the tuned circuits except output coil L4, which seemed to be resonant.

This time the result was better than I expected. Back to the TV-2 video carrier which, after retuning, showed a beautiful S9+40 dB on the Yaesu S-meter. The audio carrier was S9+20 dB and the sound was less distorted than before. This time the mixer worked very well. Back to 52 MHz, and the tuning capacitors peaked almost at their midway point. I removed the capacitor in parallel with C6 since it was not necessary. Then I adjusted the trimmer at R2 for best performance. Tuning across the band showed another pirate station, but no amateur activity.

At this time, I noted that capacitors C3 and C5 were improperly installed. Both were too far from the gate and coil, and as a result I noted a drop in gain each time I touched the connection with the voltmeter. I relocated them close to the gate and close to L2. Also, I moved C11 closer to L5 and replaced C7 with a 500-pF capacitor, removing the previously-installed 5-pF capacitor in parallel with C6 and C1. This time the TV-2 video carrier signal rose to S9+60 dB—full scale! The test at 52 MHz showed an oscillation due to the tremendous gain of the cascode amplifier. I cured the oscillation with a 10k resistor across both L2 and L3. This resulted in lowering the Q of both circuits and a flatter response across the six-meter band was achieved.

The last step was to remove the filament jumpers and to ground the unused lines. I removed also C14, C8,

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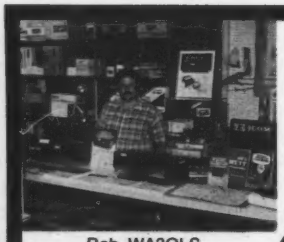
and R7. Then I installed the PCB in the box and wired the BNC connector, the output connector, and the +12-V-dc feedthrough. A final retuning with the enclosure on and a test showed the oscillator was 2 kHz too low in frequency. The cure was to install a small coil with a ferrite core in series with the crystal. A small adjustment of the core moved the frequency 2 kHz up. The modified circuit is shown in Fig. 7. Please note that the inductance in series with the crystal is not shown in the schematic. Another crystal may oscillate higher in frequency and the cure in this case is a capacitor in parallel instead of a coil in series with the crystal.

I found no amateur-radio activity on 6 meters in Caracas. Most hams here live in apartments, and their installations are prone to TVI from 6-meter transmitters due to poorly-designed TV receivers. I couldn't test the converter with a real off-the-air signal, so it was off to the laboratory. At the lab, I tuned the converter using the Sinad method and two Cushman CE6-A communications monitors, one used as a tuned i-f and the other as a signal generator. All of the tuned circuits were resonant at the midway point of the trimmer pistons. Power drain was 15 mA at 14 V dc—just 210 mW instead of 10 Watts using tubes!

One final bit of advice. You can use tetrode FETs in the same way as triodes, but properly bias the second gate or just tie both gates together and use it as a unijunction FET for a simpler circuit. I am very satisfied with the results of this modification and I hope that this guidance will be useful to all those fellow amateurs wishing to modify their old tubed gear gathering dust in the basement. Now, regarding the 33 tube sections in the KWM-2. . .■



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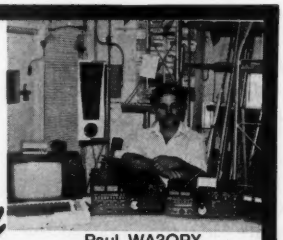

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Historically, the reporting of the audio quality of voice transmissions has been confined to readability and strength, to simply: Can you hear me? and, Am I strong? However, recent articles[1] and products[2] indicate an increasing awareness that this is not enough—many people want to hear the "personality" in the voice. There is evidence that readability is indeed enhanced by improved audio "*quality*."

What is this ephemeral entity which we call audio quality? Can it be measured in terms which are more meaningful than the conventional good, average, or lousy? In the paragraphs which follow I shall attempt to answer these questions and to suggest a reporting system which may prove of practical value for the growing number of hams who are interested in audio quality.

Frequency Range

The most fundamental attribute of the human voice is the frequency range. As will be pointed out later, there are other characteristics which are significant, but from the standpoint of intelligibility the frequency range of the voice and the frequency response of the ear are of salient importance. The plots which follow[3] give us a quantitative basis for frequency comparisons.

Fig. 1 shows spectra for typical "voiced" vowel sounds. Here we note that for the sounds "oo" and "oh" the most prominent frequencies are the third and fifth harmonics, respectively, although the fundamentals are identical. For the sound "ee," however, there are important harmonic frequencies as high as 4300 Hertz. The "unvoiced," or breath, sounds (for example, "sss") can be even higher in frequency.

Fig. 2 indicates the envelope of frequencies for a typical sampling of male voices. (Incidentally, because of their wide variety of speech sounds, the words used for this plot were "Joe took father's shoe bench out; she was waiting at my lawn." At least it's better than "Hello, test"!) Since this is a plot of sound *pressure*, a factor of two means six decibels. The average (the solid line) is seen to be relatively flat up to about 1000 Hertz and then to decline gradually with the 6-dB point at 3500 Hertz.

Fig. 3 indicates typical response curves of the human ear. Curve 1 is for a single ear; Curves 2 and 3 are for both ears—with multiple and single sources, respectively. Curve 3 is the typical ham situation, a single speaker in front of the listener. Here, we see that the maximum sensitivity of the ear is at about 3500 Hertz. Also, we note that this plot is directly in decibels, so the ear is much more peaked than the voice; there is an almost 30-dB variation from low frequencies to the fre-

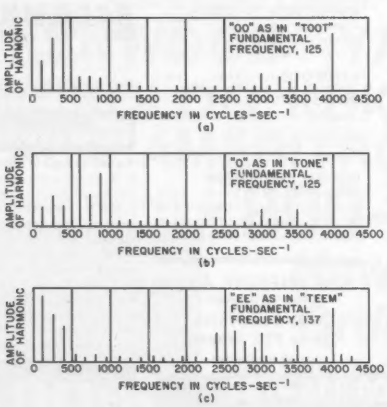
AMPLITUDE OF HARMONIC
"OO" AS IN "TOOT"
FUNDAMENTAL FREQUENCY, 125
0 500 1000 1500 2000 2500 3000 3500 4000 4500
FREQUENCY IN CYCLES-SEC⁻¹
(a)
AMPLITUDE OF HARMONIC
"O" AS IN "TONE"
FUNDAMENTAL FREQUENCY, 125
0 500 1000 1500 2000 2500 3000 3500 4000 4500
FREQUENCY IN CYCLES-SEC⁻¹
(b)
AMPLITUDE OF HARMONIC
"EE" AS IN "TEEM"
FUNDAMENTAL FREQUENCY, 137
0 500 1000 1500 2000 2500 3000 3500 4000 4500
FREQUENCY IN CYCLES-SEC⁻¹
(c)

Fig. 1. Frequency components in intoned vowel sounds.

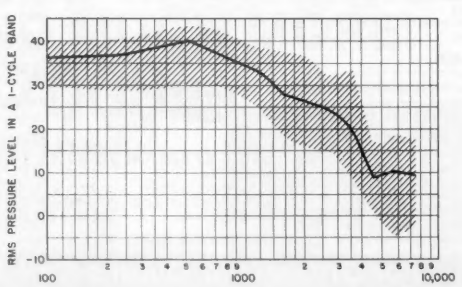

Fig. 2. Pressure vs. frequency, typical male voice.

quency of maximum sensitivity!

Now, what have we learned from all of this? Well, quite a lot! We've seen that the voice frequency spectrum above 2500 Hertz is rich in harmonics of the low tones in the typical voice and also in the sibilant sounds. Also, we have seen that the ear is relatively insensitive to the lower audio frequencies. Therefore, any reporting system for audio quality which we devise should give primary attention to both the highs and the lows, as well as to the mid-range audio.

Dynamic Range

For our purposes, the term "dynamic range" will include two connotations: (a) the ratio of significant speech-sound amplitudes and (b) the ratio of desired signal to undesired distortion products.

Referring to the first meaning, the dynamic range of voice is just the ratio of the strongest vowel sounds to the weakest or "unvoiced" sounds. Typically, this will exceed twenty decibels for voice. (For comparison, music can exceed thirty decibels.) Dynamic range is a natural and desirable voice characteristic which adds significantly to the comfort of conversational speech. The so-called speech processors in all-too-common use today have the questionable function of enhancing the weak syllables of speech sounds, thereby acting to destroy the natural dynamic range. In all considerations of audio quality for amateur radio, the key word is "comfort." After all, we are dealing with a hobby.

Referring to the second connotation, P. E. Chadwick stated in a recent article that ". . .the term, dynamic range, now means all things to all men, and almost any meaning desired can be attributed to it!"[4] Accordingly, I will include in "dynamic range" the ratio of maximum-desired transmitter-power output to the corresponding unwanted or intermodulation-distortion output. Thus, for single-sideband transmission, the ratio of wanted sideband to the unwanted sideband would be included in the dynamic range—typically in excess of 40 dB for transmitters of modern design.

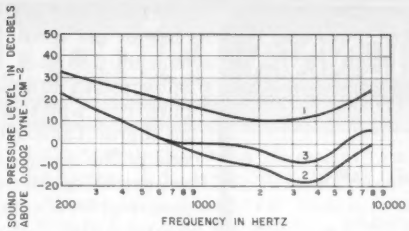

Fig. 3. Typical thresholds of audibility.

Audible Artifacts

In addition to the above categories of attributes which contribute, either positively or negatively, to the comfortable transmission and reception of amateur voice signals, there has to be a "catch-all" classification which covers "none of the above." I have chosen to call this *Audible Artifacts*. Here, we find a range of extraneous audible distractions ranging from slightly annoying or fatiguing sounds to major anomalies in the signal which can mask or interrupt reception. These include audible distortion, sounds due to switching or handling of the microphone, breath sounds due to exhaled syllables spoken directly into the mike, and background noise from fans, chairs, kids, etc. Also included in this category would be a number of electrically-generated artifacts such as hum, rf feedback, and oscillations of various types.

Now that we have provided an elementary basis for classification of the principal contributors to or detractors from good audio quality, let us consider how one might generate a meaningful voice reporting system.

Reporting

In the above paragraphs I have pointed out that a simplified reporting of the technical quality of voice transmissions should consider five attributes:

Low-Frequency Response
Mid-Frequency Response
High-Frequency Response
Dynamic Range
Audible Artifacts

If we arbitrarily decide that we wish to give an equal weight of 2 points to each of these attributes, we have a neat system for reporting quality on a scale of one to ten! Also, if we consult the ancient Q signals which go back to the early days of CW reporting, we find that the signal, QRI, refers to tone—originally reported on three levels. Let us assume that voice is enough more complicated that we need five levels for reporting rather than three, and presto, our system is clear! QRI = 10 means a breakdown of 22222; I haven't heard many on the ham bands recently who rate such a report!

Now, how do we use this reporting tool on the air? First, we must switch the selectivity of the receiver to the widest passband available (lowest selectivity). After all, you can't report on highs if the receiver doesn't pass the highs. (For example, I found that my receiver was so deficient in low-frequency response that I have substituted a miniature solid-state hi-fi amplifier for the one originally there, and guess what! I've never found a receiving situation where it helps to switch back to the original amplifier!)

Once we have determined that our receiver is capable of reproducing "good" audio it's fun to tune in a voice signal and "give it the works"!

If we are to give a reproducible quality report, we must apply the same standards to all signals. To ensure this it may be helpful to form, mentally, a set of questions relative to our five categories of reporting. For example, begin with a familiar voice:

A. Low-Frequency Response

Are the bass or low vowel sounds faithfully reproduced? Does the bass sound smooth and well-rounded, not nasal? Do you feel tempted to retune to try and improve lows? Assign 2 if the lows are excellent, 0 or 1 if not.

B. Mid-Frequencies

Do the tenor or treble tones sound smooth, not peaked? Do these tones appear to join comfortably to the lows? Are the subtle inflections of the voice rendered well? Assign 2 if the mid-range is excellent, 0 or 1 if not.

C. High-Frequency Response

Are the s-sounds (sibilants) whistling naturally? Do high-pitched voices sound natural or distorted? Are the sh-sounds clearly different from the s-sounds? Assign 2 if the highs are excellent, 0 or 1 if not.

D. Dynamic Range

Are the strong syllables (vowel sounds) strong? Speech processors often make the breath sounds really rancid! Now, tune to the unwanted sideband. (If you are using the lower sideband, the upper is the unwanted sideband.) Is there any voice audible here? The unwanted should be weaker than the wanted by at least 40 decibels. Assign 2 if the dynamic range is excellent, 0 or 1 if not.

E. Audible Artifacts

Tune back to the wanted

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sideband and listen critically to the voice. Do you hear any distortion, ac hum, background noise, or anything else which shouldn't be there? Tune off either side of the signal—is there any carrier, splatter, or other abnormal broadening of the signal? Assign 2 if no artifacts are present, 0 or 1, otherwise.

Having carefully evaluated the signal, we are now ready to give the QRI report. The report is just the sum of the five numbers assigned above—a TEN is perfection (just like in the Bo Derek movie of the same name). Less than ten needs some explanation. For this it may be helpful to give the five numbers in sequence as, for example, QRI:8 = 12122 would mean a clean signal which is somewhat deficient in lows and highs.

Conclusion

This brief article is an attempt to provide a system of reporting, numerically, the audio quality of radiotelephone signals. A Q signal which has fallen into disuse, QRI has been resurrected to help in the process. It is hoped that this suggestion will lead hams to insist upon improved voices in their loudspeakers! ■

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   Daniel Peters, "Microphone Calibration," *Ham Radio*, June, 1984.
   Cornelio Nouel, "Build Your Own Microphone Equalizer," *CQ*, July, 1984.
2. "HM-5 Microphone," *QST*, April, 1984.
3. *An Introduction to Acoustics*, Robert H. Randall, Addison-Wesley Press; Cambridge, Massachusetts.
4. "Dynamic Range, Intermodulation and Phase Noise," P. E. Chadwick, *Radio Communication*.

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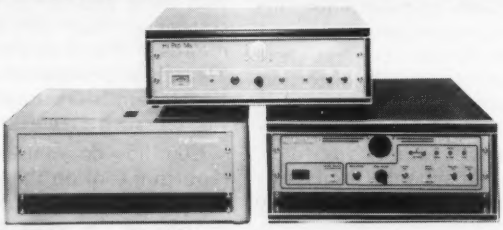

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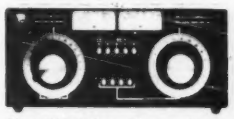

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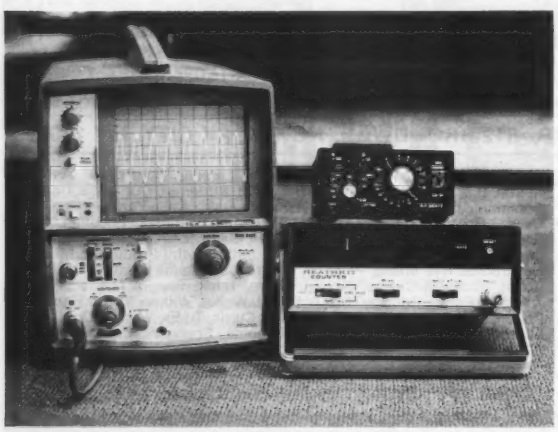


The Genie in operation.

Circuit

Q3, 4, and 5 make up the oscillator and buffer stages of the variable-frequency module. This is a standard "handbook" vfo circuit which has been modified to cover a wide frequency range. The LC circuit consists of tapped toroidal inductor L1, dual-section capacitor C1, and a 3PDT miniature toggle switch. Oscillator stability is sufficient for most short-term alignment jobs. However, long-term stability could be improved by substituting a T50-6 core for the T50-2 core at L1 and by substituting a quality wafer switch at S1. For fixed values of C, NPO ceramic capacitors are more stable than silver mica.

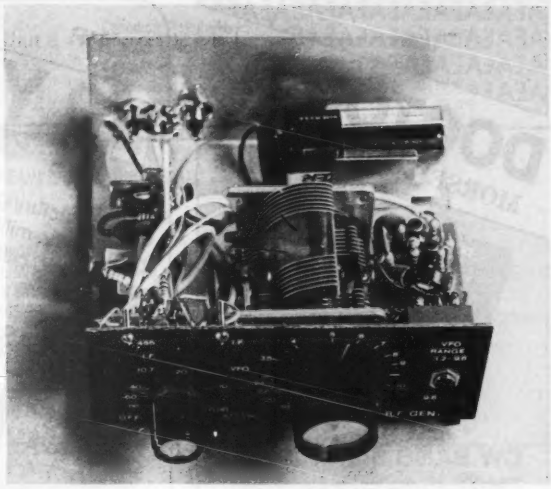
Crystal oscillators Q1 and Q2 are adaptations of simple untuned bfo circuits. The 455-kHz module uses a ceramic resonator in place of a crystal. If a crystal is substituted, a much larger netting capacitor is required to produce sufficient trimming range.

Slide switches activate the desired oscillator. S2 switches between the variable and fixed oscillators, and S3 selects the fixed oscillator frequency. A single DP3T slide or rotary switch could replace S2 and S3 to provide a more straightforward switching arrangement.

The attenuator is a simple voltage divider controlling the oscillator output level. This provides a wide range of signal outputs for casual alignment work. For more critical applications, a step attenuator is a worthwhile addition (refer to pages 25–42 in the 1985 *ARRL Handbook* for a possible design). A second attenuator adjusts signal level to the frequency-counter output. This is set to the minimum level

Parts List

RFC1— 1 mH, Miller 70F103A1, Radiokit
RFC2— 10 mH, Miller 70F102A1, Radiokit
Y1— 10.7-MHz crystal, Type GP-1, Cat. #4331626, International Crystal Corp., $8.67 each
Y2— 455-kHz ceramic resonator, CSB-455E, Radio Shack
L1— 38 turns #28 on T50-2 (taps at 4, 10, and 17 turns)
C1— 15-90/15-200 pF with trimmers and vernier. BCD Electro, $2.50 each (p. 28, Cat. #73)



Inside view of the Genie.

required for stable readout on the counter across the generator's range.

Zener D1 and LED D2 make up a simple off/on and battery-status indicator. When battery voltage falls below the voltage threshold established by the zener, the LED no longer illuminates. A 1k series resistor limits LED brightness in order to prolong battery life.

Construction

Since small size and simplicity were desirable for my application, I built the generator into a compact 2" X 4" X 4" case. To reduce the chance of leakage, all of the longer rf leads were shielded. Overall layout was not critical—but normal precautions were observed when assembling the vfo section. Vfo components were carefully secured to ensure mechanical stability, and the board was mounted as close to the bandswitch and tuning capacitor as possible. Leads to the bandswitch, tuning capacitor, and inductor were formed from stiff bus wire and kept short. The vfo inductor was mounted on the switch itself, held firmly in place by the mounting leads.

The tuning capacitor I chose is particularly well suited for a signal generator since it has two sections with different capacity ranges, built-in trimmers, and a reduction drive. It is available from BCD Electro for $2.25 and comes complete with a tuning knob and pointer. With a little experimentation and a different bandswitch, frequency coverage of the generator could easily be extended and spread out over several bands.

Calibration of the variable oscillator was accomplished with the aid of a frequency counter. Some manipulation of the trimmers on C1 was necessary to butt the beginning of the high-frequency band to the end of the low-frequency band. Once the ranges were established, the frequency scales were marked on the panel. I used Presstype dry transfer lettering—a painstaking exercise that took a couple of hours to complete. Although this gives a professional appearance to the completed unit, a paper scale marked in pencil or ink would be just as functional.

RG-176 miniature coax was used for test cables. One cable is terminated with miniature clip leads for connection to the circuit under test, and the other with a BNC connector for connection to a frequency counter.

Operation

The Genie is very simple to use. When paired with a frequency counter, accuracy is a function of the counter's readout. Since the vfo is heavily buffered, the generator remains stable under varying loads. The only problem I have encountered is a function of the generator's wide frequency range. Setting the generator to a precise frequency on the 20- or 15-meter band becomes very touchy due to the lack of bandspread.

Conclusion

The "Rf-Genie" was designed to fill the performance gap between older "kit" generators and expensive lab-quality units. It provides stable coverage of the more popular HF ham bands and offers crystal-controlled accuracy on the two most common i-f frequencies. Many options can be added to suit the individual builder. ■

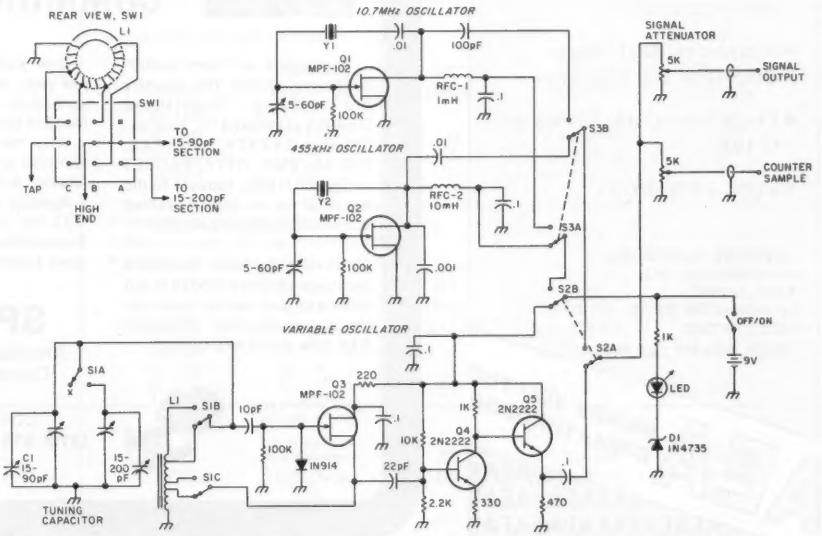


Fig. 1. Schematic for the "Rf-Genie."

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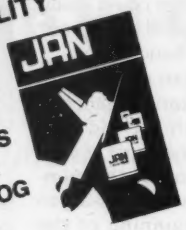

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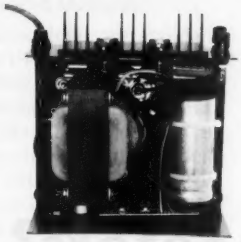

INSIDE VIEW – RS-12A

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RM-50A	37	50	5¼ × 19 × 12½	50
• SEPARATE VOLT & AMP METERS				
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W X D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

RS-M SERIES

MODEL RS-35M

• Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

VS-M SERIES

MODEL VS-20M

- Seperate Volt and Amp Meters
- Output Voltage adjustable from 2-15 volts
- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

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Operate OSCAR on 10 Meters?

It's a snap—all you need is this versatile satellite converter!

The transceive mode of operation is a worthwhile convenience—you're on that DX station without causing those QRM-type frequency-alignment tuning whistles. This 435-MHz transmit converter has an output of over 2 Watts, and the 146-MHz receive converter features a low-noise GaAsFET preamplifier. Most of the parts can be purchased from Radio Shack, and the others are readily available by mail order. I have included in this article descriptions of a test assembly for evaluating frequency spectrum and a simple dummy load/power-measuring device. No other special test equipment is required. The critical frequency-alignment measurements can be made using the HF transceiver calibration.

How It Works

Confirming access into the OSCAR-10 satellite requires simultaneous operation of the transmitter and receiver, complicating the HF transceiver conversion. The method of solving this problem is indicated in Fig. 1. Access is confirmed by switching to a test mode where a separate 29.6-MHz source activates the transmitter mixer while simultaneously the LO (local oscillator) frequency is lowered by 10 kHz. Without the frequency shift, the received satellite response would have the same frequency as that of the test source.

Misalignment of the transmit/receive frequencies caused by Doppler shift or minor equipment variances are compensated for by a receiver LO frequency-trim capability. Tuning the receiver to the frequency corresponding to the transmitter LO shift (29.660 kHz) and trimming the receiver LO adjustment while listening to the satellite response will result in transceive tracking.

It should be noted that satellite sideband reversal is accommodated with the transmitter mixer LO on the low side and the receiver mixer LO on the high side of the operating frequencies. In actual operation, and with my particular HF transceiver, I can hear the tail end of the satellite response as it is delayed from the long propagation path. Success of this feature requires a

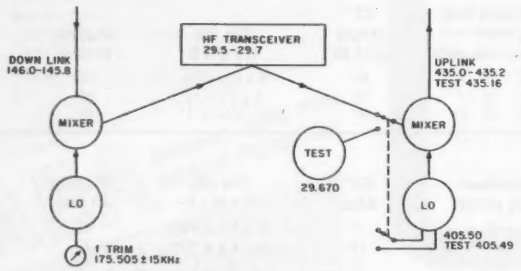


Fig. 1. Concept block diagram.

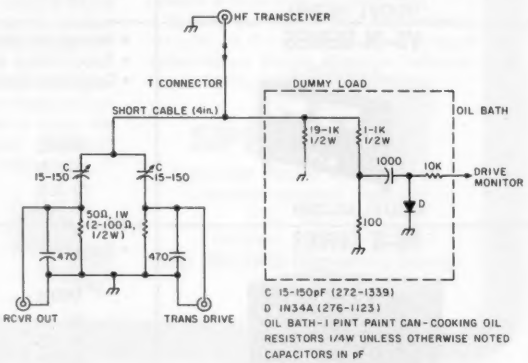


Fig. 2. HF transceiver interface.

transmitter hold time of less than 200 ms. This type of cross-check for satellite access is useful but it is not a requirement.

Fabricated Methods

Etched lines are avoided in the UHF stripline circuitry by using a glue-down stripline technique. Strips are cut from double-sided glass PCB of the size normally associated with etched-circuitry dimensions. One side is smeared with glue and firmly pressed against the base PCB. No dc connection is required between the glue interface. Dc isolation is provided by filing a small groove in the stripline foil and soldering the related coupling capacitor across the groove. Tests indicate the performance to be equivalent to that of etched circuitry. Components other than striplines are mounted using small PC pads glued to the primary PCB, the parts soldered directly to the pad foil for interconnection and support. This fabrication method is exceptionally flexible. If a mistake is made, simply lift the stripline or mounting pad with a knife and make the necessary change.

HF Transceiver Interface

The HF transceiver is operated at the minimum power level that does not compromise its performance. Only 0.5 Watts is required for the converter, therefore most of the power is dissipated in a dummy load. The interface includes two capacitive variable attenuators, each adjustable from −10 to −30 dB. One is adjustable to provide optimum transmitter converter drive, and the second, used to protect the receiver converter from high rf levels, is normally operated at maximum attenuation. Their effect on load impedance is minimized by connecting them through a short 4-inch cable to a T-connector on the dummy load.

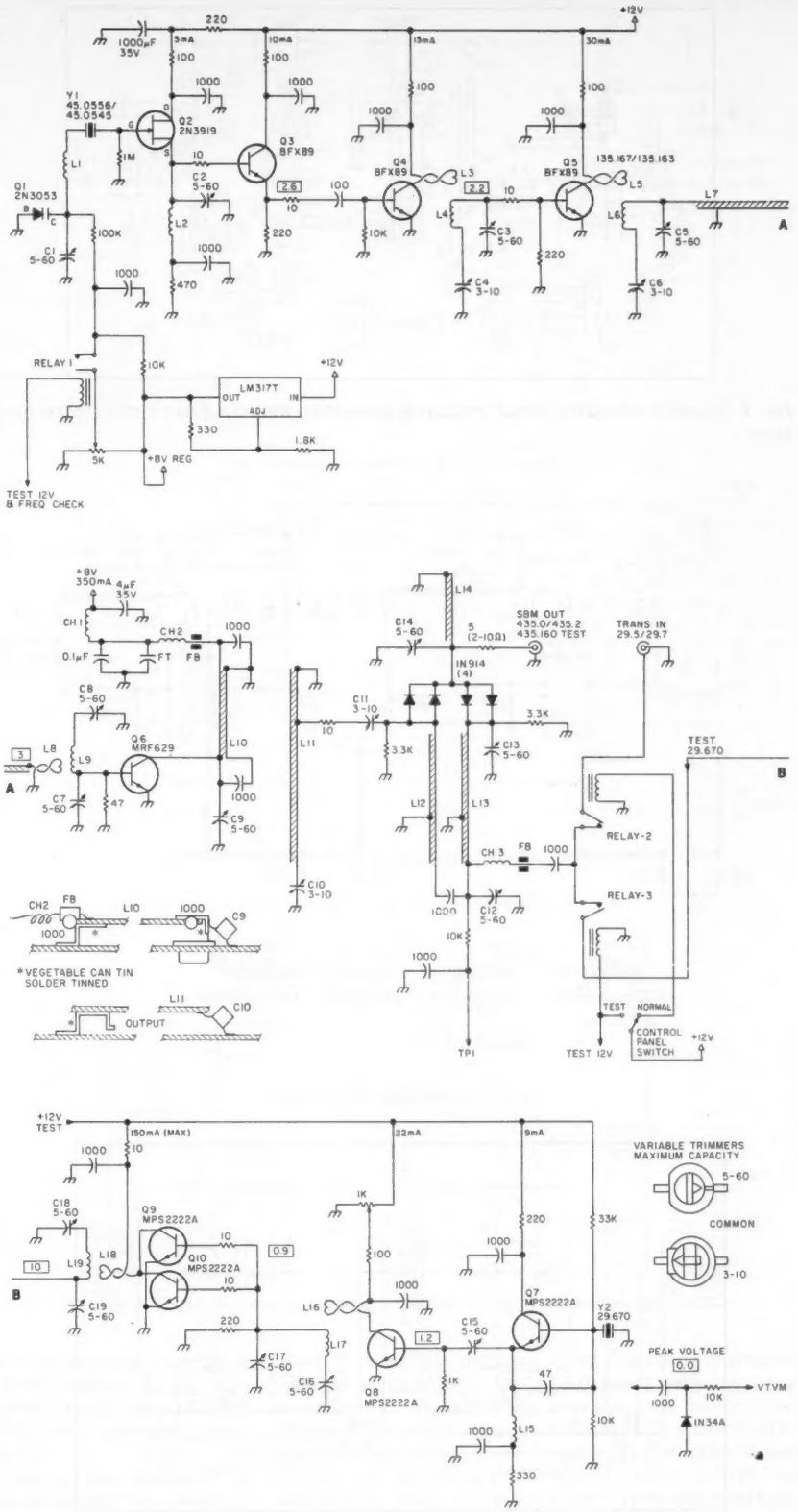


Fig. 3. Transmit converter.

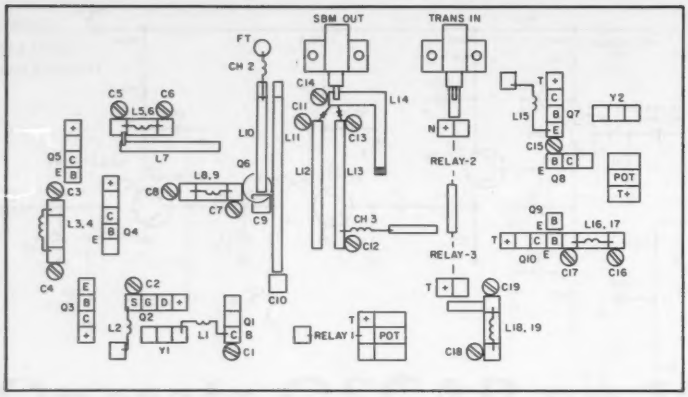


Fig. 4. Transmit converter layout indicating glue-down mounting-pad and stripline locations.

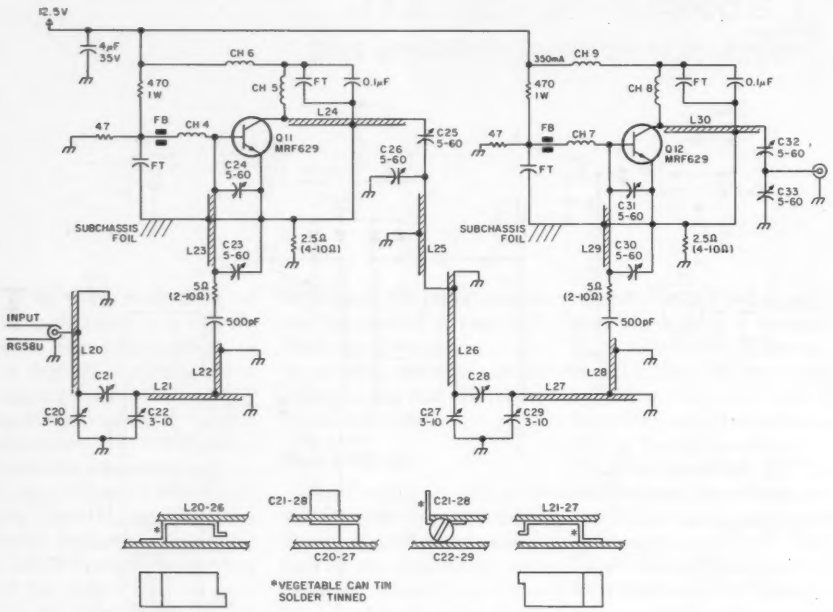


Fig. 5. Amplifier/filter circuit.

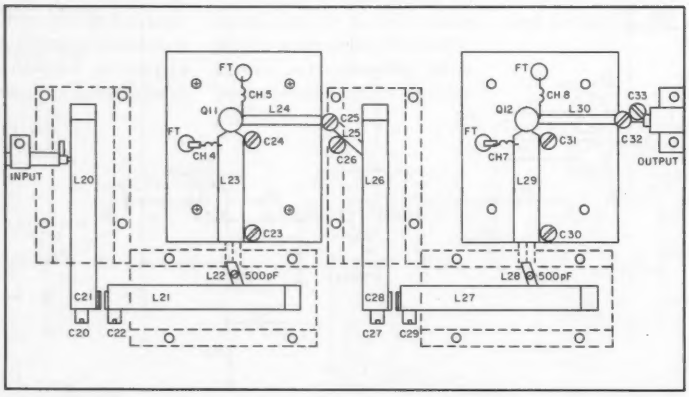


Fig. 6. Amplifier/filter layout.

The dummy load is twenty 1/2-Watt, 1k resistors connected in parallel. They are clustered around an RG-58/U cable, soldered to two 1-1/4"-diameter plates. The plates are parallel and spaced the length of the resistor. The complete assembly is immersed in a pint of cooking oil. The dummy load can absorb 100 Watts for short periods.

Transmit Converter

The transmit converter LO starts with a 45-MHz vxo (variable crystal oscillator). The normal operating frequency (45.0545 MHz) is established by the trim adjustment, C1, and the test frequency (45.0556 MHz) is trimmed by a 2N3053 connected to operate as a varactor. In the test mode, the varactor is switched by relay 1 to a 5k potentiometer for frequency trim.

The vxo is a very useful, stable, and reliable device. However, two precautions are required. First, it is very sensitive to common capacitance at the crystal inductance junction. Due to this, and to reduce stray capacitance, I have avoided using a standard crystal socket, making one using pins from an old miniature tube socket. Also, care has been taken to isolate the crystal from the mounting PCB.

Second, it likes a slow turn-on. This is accommodated in the circuit using a 220-Ohm, 1000-mF filter in series with the supply voltage. The vxo is followed by a buffer, tripler, and amplifier. The BFX89 was chosen for these stages due to its high performance and because it's available on the surplus market at low cost. The 135-MHz amplifier has an output of 150 mW.

The Q6 MRF629 used in the 405-MHz tripler has two unusual features. First, the emitter is tied to the TO-39 case, and soldering it to both sides of the double-sided mounting PCB provides adequate heat sink. Second, it

contains Faraday shield diodes between the collector and emitter for the purpose of isolating the base input from the collector.

When operating below the rated voltage, the diodes function as varactors; the transistor then operates as an effective frequency multiplier (Motorola EB70A). In the circuit, the third harmonic is picked off by a high-Q stripline, L11–C10, and inductively coupled to a second stripline, L10–C9, that is connected directly to the MRF629 collector. The output is over 0.5 Watts.

The 1N914 SBM (single-balanced mixer) uses parallel diodes to increase the power-handling capability. The 180° phase shift is handled by two 1/4-λ striplines, L12-L13. Phase-nulling trim is by C12, and amplitude-nulling trim is by C13. They can be adjusted to provide 40-dB rejection of the LO at the SBM output. However, under dynamic operating conditions as a mixer, the rejection is reduced to approximately 20 dB. The dominant output at the low-Q stripline, L14–C14, is approximately 100 mW at 435 MHz. Attenuation of the 376-MHz image is about 6 dB.

TP1 is an invaluable test point. It confirms proper SBM drive by the LO (10 V) and the LO + signal (13 V). The SBM signal is from either the HF transceiver or the test source as switched by relay 2 or relay 3.

The test source has a maximum output of 1 Watt at 29.6 MHz. In normal operation it is adjusted by a potentiometer in the driver supply voltage to about 0.5 Watts to the SBM.

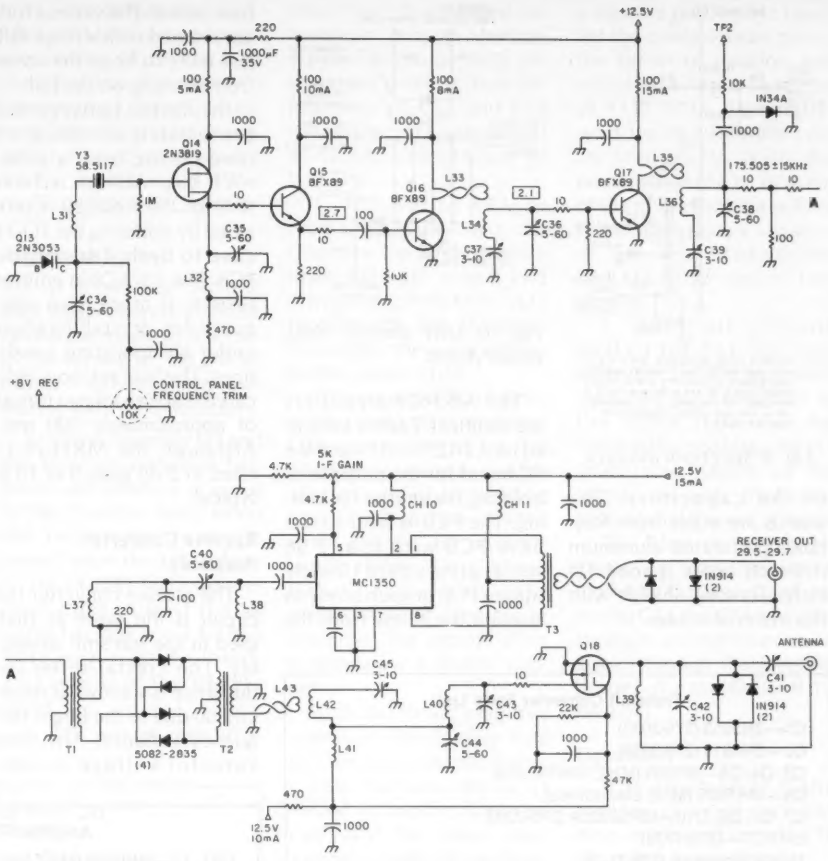


Fig. 7. Receive converter circuit.

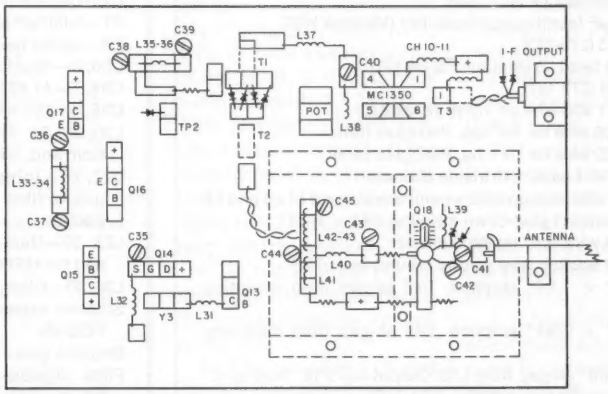


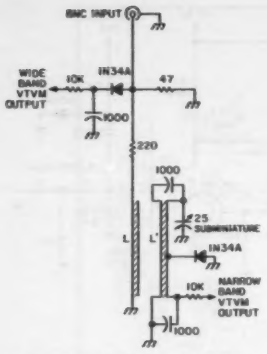
Fig. 8. Receive converter layout indicating mounting-pad locations.

Amplifier/Filter Assembly

A filter is required to discriminate against the SBM 405-MHz LO leakage and the 376-MHz image. There are actually two filters, each having two air-gap high-Q striplines. Each of the filters can be adjusted to provide 20-dB isolation of the 405-MHz LO while peaked at the 435-MHz operating frequency.

Image discrimination is much greater. The insertion loss of each filter is approximately 1 dB. The critical element of the filter is the home-built capacitor between the two striplines. It is adjusted for critical coupling between the two tuned circuits by bending the 5/16″-square plates for different capacity.

The capacitor plates and other mounting hardware associated with the striplines are made from vegetable-can tin, tinned with solder. The stripline shield size is 13/16″ × 9/16″ × 2-3/4″. They are mounted leaving the stripline ends exposed to permit adjustment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WIDE BAND VTVM OUTPUT
10K
IN34A
47
1000
220
1000
25 SUBMINIATURE
L
L'
IN34A
10K
NARROW BAND VTVM OUTPUT
1000
L, L' - DOUBLE SIDED GLASS PCB, 3/8 in. × 2 in., AIR-GAP FROM THE PRIMARY MOUNTING BOARD (2 1/4 in. × 4 3/4 in. PCB) MAINTAINED AT 1/4 in. WITH A TIN S BRACKET AT THE END. L, L' SPACING 1/8 in. AIR-GAP, DIODE CONNECTION CENTER TAP OF L'.

Fig. 9. Spectrum monitor.

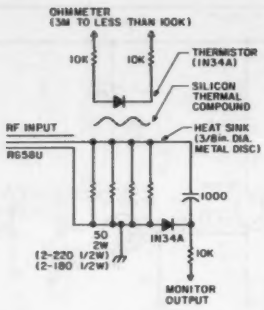

Fig. 10. UHF dummy load/ power meter.

of the capacitors. The shields are made from Reynolds perforated aluminum (1/8-inch holes spaced 1/4 inch). Forming shields with this material is easy.

The MRF629 amplifiers are identical. Each is mounted on a 2-1/2″ × 3″ separate PC board for the purpose of isolating the emitter for biasing. The PCB is held to the base PCB with four 2-56 screws using a third 1/2-inch-square PCB at each screw to insulate the screw from the base board. The various foils are reamed with a large drill (1/4 inch) to keep the screw from shorting on the foil.

Insulation between the two boards is not critical—I used plastic from a sandwich bag. Adequate heat sink for the MRF629 is provided by soldering the TO-39 case to both sides of the PCB. The 2-1/2-Ohm emitter resistor is more than adequate for dc stabilization under all operating conditions. The bias resistors indicated make an idling current of approximately 100 mA. Although the MRF629 is rated at 8-dB gain, 9 or 10 is typical.

Receive Converter Assembly

The receive converter LO circuit is the same as that used in the transmit assembly. The crystal series inductance is somewhat more critical due to the larger frequency variance. Also, the varactor voltage is controlled by a potentiometer at the operator position rather than in the module.

The 175-MHz output of about 100 mW is more than enough for the DBM (double-balanced mixer). A 4-dB pad is used at that interface to ensure optimum termination. The diode-ring DBM provides excellent port-to-port isolation even when using ordinary unmatched diodes. Don't hesitate to make your own DBM—it's easy to build. Twisting the trifilar wires together before winding them on the toroidal core will minimize the chances of scraping the insulation.

The preamplifier dual-gate GaAsFET was purchased as a surplus MRF966. However, the assembly received is marked TI201/45-005 and it has different bias characteristics. Having no data sheet, I experimentally developed operating conditions I believed to be near

Transmit Converter Parts List

Q1—2N3053 (276-2030)
Q2—2N3819 (276-3035)
Q3, Q4, Q5—BFX89 (MHZ Electronics)
Q6—MRF629 (MHZ Electronics)
Q7, Q8, Q9, Q10—MPS2222A (276-2009)
LM317T—(276-1778)
1N914 diodes (4) (276-1122)
Y1—45.0556 MHz; Y2—29.670 MHz (ICM 031081)
5-60-pF trimmers (15) (272-1340)
3-10-pF trimmers (4) (272-1338)
FT—0.001-μF feedthrough capacitor (Meshna H30)
Relay 1, 2, 3 (275-233)
FB—ferrite bead (2) (Amidon FB-64-101)
Ch1—10 μH (273-101)
Ch2, 3—15T #30 wire on 1/2-W 1k resistor
L1—25T #26 wire on 1/4″-dia. Plexiglas form
L2—14T #22 wire on 1/4″-dia. Plexiglas form
L4, L6—6T #14 wire, 1/4″ inside diameter
L3, L5—3T #22 hookup wire wound around end of L4 and L6
L7—Interconnect glue-down stripline 1/8″ × 1-3/4″
L9—5T #14 wire, 1/4″ inside diameter
L8—1T #22 hookup wire wound around end of L9
L10—3/16″ × 1-1/2″ stripline, 1/4″ air-gap from mounting board
L11—3/16″ × 2-3/4″ stripline, 1/4″ air-gap from mounting board
Spaced 1/8″ air-gap from L10. Output tap 5/16″ from end.
L12, L13—Glue-down stripline 1/8″ × 2″
L14—Glue-down stripline 3/16″ × 2″
Stripline material—.059″ double-sided glass PCB (Meshna PCB 28)
Stripline glue—All purpose adhesive, acetate type (64-2307)
Mounting board—6″ × 11″ double-sided glass, .059″ PCB (Meshna PCB 28)
All fixed capacitors in pF unless otherwise noted. Disc ceramic/50 V
All fixed resistors 1/4 W, 5% unless otherwise noted
Manufacturer catalog numbers in parentheses (Radio Shack and others)

Amplifier/Filter Parts List

Q11, 12—MRF629 (MHZ Electronics)
5-60-pF trimmers (8) (272-1340)
3-10-pF trimmers (4) (272-2338)
C21-C28—5/16″ × 5/16″, 1/16″ minimum air-gap
FT—0.001-μF feedthrough capacitor (Meshna H30)
FB—ferrite bead (2) (Amidon FB-64-101)
Ch6, 9—10 μH (273-101)
Ch4, 7—4T #22 wire, 1/8″ inside dia.
Ch5, 8—15T #22 wire, 1/8″ inside dia.
L20, 21, 26, 27—Stripline 3/8″ × 3″, input/output tap 5/8″ from end, 1/4″ air-gap from mounting board
L22, 28—Interconnect glue-down stripline 1/8″ × 3/4″, groove filed 1/4″ from end to accommodate blocking capacitor
L23, 29—Glue-down stripline 3/8″ × 3/4″, beveled at one end for MRF629 connection
L24, 30—Glue-down stripline 1/8″ × 3/4″
Stripline material—.059″ double-sided glass PCB (Meshna PCB 28)
Stripline glue—All purpose adhesive, acetate type (64-2307)
Filter shields—Inside clearance, 13/16″ × 9/16″, length 2-3/4″
Reynolds perforated aluminum (1/8″ holes spaced 1/4″)
Mounting board—6″ × 11″ double-sided glass PCB (Meshna PCB 28)
Subchassis (2)—2-1/2″ × 3″ × .059″ double-sided glass PCB (Meshna PCB 28)
Subchassis/mtg. board insulation—Sandwich bag plastic
All fixed capacitors disc ceramic/50 V unless otherwise noted
All fixed resistors 1/4 W, 5% unless otherwise noted
Manufacturer catalog numbers in parentheses (Radio Shack and others)

optimum for low noise. The collector current is 10 mA at 7 volts. In the circuit, back-to-back 914 diodes across the input protect the FET gate from input transients. The narrowband T-network at the output discriminates against the 376-MHz image.

In the fabrication, the Q18 X-package gates are mounted on two glue-down pads and the source is mounted on a pad made from #14 wire bent in a U-shaped closed loop. The drain lead is soldered directly to the 10-Ohm resistor, minimizing inductance by carefully bending the lead upward (clamp it with long-nose pliers and bend the remaining portion). I made a noise-source comparison with my old MRF901 preamp. The noise figure is indicated to be improved by a small but measurable amount.

The MC1350 integrated circuit amplifies the 29.6-MHz DBM output up to approximately 40 dB. The high amplification is required to compensate for the interface attenuator. HF transceiver rf feedback is limited by back-to-back 1N914 diodes across the IC output.

Alignment Notes

1. It is required that the MRF tripler operate in a near saturation mode with a collector current of 300 mA or more. A drive of approximately 100 mW is necessary.

2. The transmitter LO and the test-source second harmonic will produce a signal in the 14-MHz band when the receiver antenna is placed near the LO. Adjust C1 for 14.2844 MHz with relay 1 open. Adjust the 5k varactor pot for 14.2855 MHz with relay 1 closed. This results in the 10-kHz offset.

3. TP1 will be over 10 V when the LO is peaked for maximum output. Monitoring the SBM output with the spectrum monitor, null adjustments of C12 and C13 will result in LO rejection of 40 dB while maintaining 10 V at TP1.

4. TP1 will be 13 V or more while in the test mode. Optimize the SBM for maximum 435-MHz output and minimum 405-MHz LO feedthrough. The LO rejection under these conditions will be about 20 dB.

5. Adjust the first filter with a peak voltmeter at C23, optimizing it for the 435-MHz response. Gradually reduce C21 by bending the 5/16″-square plates while continually optimizing the output with C20 and C22. Continue this until there is a slight decrease in response. The second filter is adjusted in a similar manner.

6. With normal amplifier operation, the dummy load will become very hot within a few minutes without forced-air cooling. It can be calibrated for power measurements with a dc voltage, noting the thermistor resistance vs. time. The thermistor in my particular assembly changes from 2 M to 160k in three minutes with 2 Watts input. A similar measurement with 1.5 Watts is 290k, and for 2.5 Watts, 60k. Use a blower to cool off the dummy load between calibration runs. The calibration indicated 2.5 Watts output from the transmitter.

7. In the receiver LO, restrict TP2 to no more than 3 V by increasing the capacitance, C36.

8. The receiver LO and the test source will produce a signal in the 28-MHz band. Set the control-panel pot at the center of rotation and adjust C34 for a signal at 28.8317 MHz. This represents the 58.5017-MHz center frequency. With the proper value of L31, rotation of the potentiometer will result in a frequency variance of ±5 kHz around the 28.8317-MHz center frequency.

9. With all circuits peaked for 29.6-MHz response in the HF transceiver, the DBM will contribute to the noise. This can be checked by disabling the LO (place your fingers on the crystal housing); there will be a small decrease in noise.

10. The rf amp will greatly increase the noise. Optimize the noise figure by tuning C43 and C44 while listening to a noise source or a signal through the antenna (hopefully the OSCAR-10 beacon).

Operation

It is assumed that the transceive converter has been interfaced with the final uplink transmitter.

1. Initiate the test mode and lower the frequency of the HF transceiver 10 kHz as compared to the test-source frequency.

2. Increase the HF transceiver output for optimum uplink power.

3. Tune the control-panel trim potentiometer for satellite response.

4. Switch to normal operation. The system will be in the transceive mode of operation.

5. Check the frequency alignment approximately every hour for Doppler compensation. ■

Receive Converter Parts List

Q13—2N3053 (276-2030)
Q14—2N3819 (276-3035)
Q15, 16, 17—BFX89 (MHZ Electronics)
Q18—MRF966(?) see text (MHZ Electronics)
MC1350 (276-1758)
5082-2835 diodes (4) (276-1124)
1N914 diodes (4) (276-1122)
Y3—58.5117 MHz (ICM 031081)
5-60-pF trimmers (6) (272-1340)
3-10-pF trimmers (5) (272-1338)
Ch10, 11—10 uH (273-101)
L31—22T #26 wire on 1/4″-dia. Plexiglas™ form
L32—10T #22 wire on 1/4″-dia. Plexiglas form
L34, 36—4T #14 wire, 1/4″ inside dia.
L33, 35—2T #22 hookup wire wound around end of L34 and L36
L37—17T #22 wire, 1/8″ inside dia.
L38—20T #26 wire on 1/4″-dia. Plexiglas form
L39—4T #14 wire, 1/4″ inside dia.
L40, 42—6T #14 wire, 1/4″ inside dia.
L41—3T #14 wire, 3/16″ inside dia.
L43—1T #22 hookup wire wound around end of L42
T1, T2—8T #26 wire trifilar wound on FT37-67 toroidal core (Amidon)
T3—10T #26 wire bifilar wound on FT37-67 toroidal core. Secondary 4T #22 hookup wire wound over the bifilar winding (Amidon)
Mounting Board—6″ × 9″ double-sided glass, .059 PCB (Meshna PCB 28)
All fixed capacitors in pF unless otherwise noted; disc ceramic/50 V
All fixed resistors 1/4 W, 5% unless otherwise noted
Manufacturer catalog numbers in parentheses (Radio Shack and others)

Part Suppliers
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Fall antenna issue—9 skyhooks!

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Touchtone data display, transistor tutor, line conditioner

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BACK ISSUES

A Gentleman's Antenna

The solution to an age-old problem: How do you fit a 160m wire onto a 40m lot?

Bill Clarke WA4BLC
Box 2403
Falls Church VA 22042

Only a few years ago, interest in the 160-meter band had lagged to almost nothing. The reason was simple: We as hams had become appliance operators and, until only recently, our appliances did not operate on 160. Well, all that's changed now.

Just browse through this magazine and look at the ads for new all-solid-state HF transceivers. With few exceptions, all operate on the Top Band. Now that the capabilities are there for 160, can most of us operate there? A resounding NO!

The big limiting factor for successful operation on 160 meters is the size of antennas needed. There are two basic antennas that see use on 160: the vertical and the dipole (or its cousin the vee).

Antennas

Verticals are basically low-angle radiators—very good for DX but not so good for local (under 500 miles) contacts. Verticals also require extensive ground work. This means much digging and laying of radials, with the end result supposedly a "perfect rf ground." It is a lot of work that can involve thousands of feet of wire for the radials and an equal amount of digging. Then there is the reseeding of the damaged lawn, to say nothing of what the XYL has been saying about your efforts. I won't even mention those quiet whispers among the neighbors.

There is an easier way: a dipole antenna. It is a wire antenna, as I am sure you all know, requiring only a feedline and a place between supports to hold it up in the air. No ground radials! Of course you do need 246 feet between the supports. That 246 feet is a long way—in fact, so long that most suburban antenna farms (house lots) cannot hold it. You could ask your neighbor if he would mind if you hooked part of your antenna into one of his trees. You know your neighbor...the one that owns the new TV you tear up on 20 meters during "Monday Night Football."

If you're like me, you don't want to owe your neighbor anything. I'll do it myself, thank you. So now what do you do? Build a reduced-size dipole. It's a good idea, you say, but you don't want to do all the math, right? OK, read on—I've done it for you.

The Short Answer

A shortened dipole is inductance loaded. This inductance must be placed between parts A and B of each dipole element (see Fig. 1). The inductance and element lengths vary depending upon the total length of the antenna used.

Measure between the two supports you plan to use (or measure the height of the single support you plan to use in the case of an inverted vee). Remember that the larger (closer to full size) the antenna is, the more efficient it will be (see Table 1). Table 1 is based upon computer design information for 1.9 MHz.

Coil Construction

In Table 1 the number of

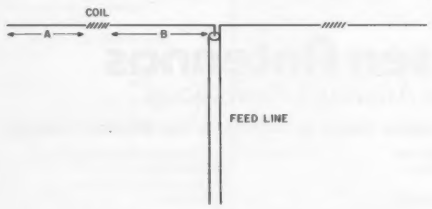

Fig. 1. An inductance-loaded shortened dipole.

Overall Length (ft.)	Element A Length	Number Of Coil Turns	Element B Length
246.3	full-size antenna		
221.3	66.5	10	44.3
197.1	59.1	20	39.4
172.4	51.7	33	34.5
147.8	44.3	48	29.6
123.2	36.9	65	24.6
98.5	29.6	86	19.7

Table 1.

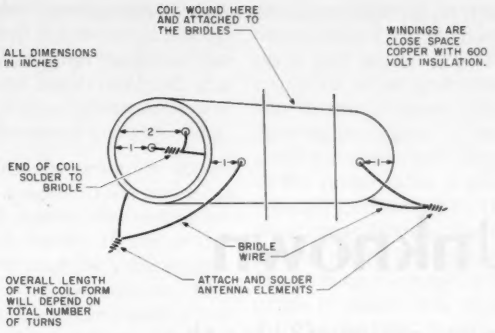
COIL WOUND HERE AND ATTACHED TO THE BRIDLES
WINDINGS ARE CLOSE SPACE COPPER WITH 600 VOLT INSULATION.
ALL DIMENSIONS IN INCHES
END OF COIL SOLDER TO BRIDLE
BRIDLE WIRE
OVERALL LENGTH OF THE COIL FORM WILL DEPEND ON TOTAL NUMBER OF TURNS
ATTACH AND SOLDER ANTENNA ELEMENTS

Fig. 2. Loading-coil detail.

turns for the coil is given. The coil is made by winding #12 insulated house wire on a form made of 2½"-outside-diameter plastic pipe. I use 2"-inside-diameter Amoco rigid PVC conduit. The wire is close wound, with the plastic insulation acting as the spacer. The result is a coil with a pitch of 8 TPI (see Fig. 2).

Installation

The antenna is installed exactly as any other dipole or inverted vee. I do not recommend the use of a balun but suggest the use of a good center insulator and RG-8 coax (you will probably be running an amplifier someday). The antenna is tuned by the usual method of an swr bridge and trimming or adding to the ends of the elements. To raise the resonant frequency, shorten the antenna. To lower it, lengthen the antenna. ■

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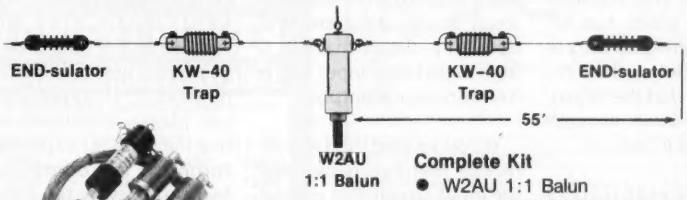

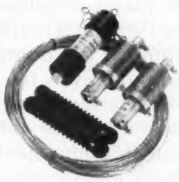

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Probe the Unknown

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While trying to align a surplus receiver, I found I needed an rf probe. I threw together the typical rf probe found in all the handbooks. This probe, shown in Fig. 1, consists of a .01-uF capacitor to block the dc component of the signal, a shunt germanium diode which develops the voltage across it, and a simple RC filter to smooth the output waveform. I twisted the component leads together, connected the makeshift probe to the circuit, and tweaked the adjustment of the LC circuit I was trying to align from one end to the other without finding a peak. After the usual amount of cursing and contemplation of the ramification of Murphy's Law (with its usual corollaries), some semblance of reason prevailed and a more scientific approach was decided upon to try to find the solution to the problem.

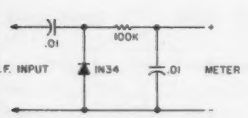

Fig. 1. Simple rf probe.

The LC circuit I was trying to align was in the synthesizer section of the receiver with a crystal-derived known frequency across it and within the range of one of my other receivers. I loosely coupled the antenna lead of the receiver to the high side of the LC circuit, tuned the receiver to the correct frequency, and found I could easily peak the circuit using the S-meter on the second receiver. I realized that the problem was that the probe had far too much loading for the circuit and had detuned the circuit so much that the adjustment didn't have enough range to bring it back in.

After congratulating myself on the speed with which I had found the solution (two hours including cursing), I decided what I obviously needed was an rf probe that would operate over the range of frequencies that I normally use, have good sensitivity, and not load the circuit. It seemed that some form of impedance transformation was required. An emitter follower wouldn't fill the bill because the input impedance is relatively low. Junction field-effect transistors (FETs) have a high input impedance and aren't too likely to be zapped. However, when used as a source-follower, the output impedance must be kept quite high in order to get reasonable gain. The solution was to couple a source-follower input stage to an emitter-follower output stage and end up with a circuit that has a high-impedance input and a low-impedance output.

If you've read this far, you realize that I've reinvented the input circuit that is used in many frequency counters, both commercial and homebrew. Well, great minds run in the same channel, right? I found I could get −5 V from my analog meter, so the final circuit uses a P-channel FET and a PNP transistor; it is shown in Fig. 2. If you have +5 V available, you could try substituting a 2N5457 and a 2N3904 for the transistors I used. It might be wise to breadboard the probe if you plan to make substitutions, just to make sure everything works.

Next comes the prob!em of packaging. If you can find some of the subminiature .01-uF capacitors that are about the size of a 1/4-Watt resistor, the unit can be built inside a ball-point pen (actually it's like building a ship in a bottle—you build the circuit outside, *then* slide it inside the pen). A pictorial diagram of the probe is shown in Fig. 3 for those of you who want to try this method. It is important to use plastic transistors with one flat side (TO-92) to allow room for the component leads to pass by the transistors if you build the pen version—otherwise nothing is critical. Component leads for the pen version are just laid side by side and soldered with a minimum of

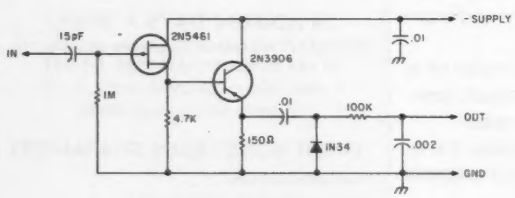

Fig. 2. Rf probe schematic.

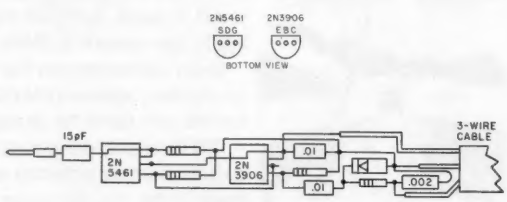

Fig. 3. Pictorial diagram.

solder. Sleeving may be used where it's deemed necessary, but after the guts of the probe are assembled, the leads may be bent so there is no danger of them touching.

Test the probe by applying a signal to the probe tip and reading the output on your meter. If the probe checks out OK, you can glob epoxy on the probe tip, transistors, and cable and slide it into the pen body. I used a pin with a shoulder from a surplus connector for the probe tip. Pull the tip with a pair of pliers until the shoulder hits the end of the pen. Screw the two halves of the pen together and quickly retest the probe to make sure you didn't short anything out assembling the probe. Let the epoxy harden.

The probe will work from 15 kHz to beyond 30 MHz at levels of up to 2-1/2 V without clipping, from a −5-V supply, and supplies up to −15 V can be used for the supply. The input is sensitive enough to pick up an rf signal of about 1 V if the probe tip is just placed near the insulation of an unshielded wire or near a tuned circuit carrying the signal. In most cases the stray capacitance of the probe cable is great enough compared to the input capacitance so that no ground return is necessary. The dc output voltage of the probe is about 20% lower than the rms input, but this is generally no problem if you are only interested in the relative value of the signal, i.e., peaking a tuned circuit. Diode type probes, whether they are active like this one or passive like the handbook version, are quite nonlinear on low-level signals, so calibration was considered a waste of time.

Two notes of caution: When using the probe, remember not to stick it in your pocket and walk off with it. Also be prepared for comments like, "Wot ya gut there, an electric pen?" ■

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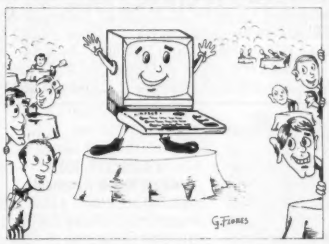

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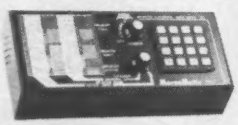

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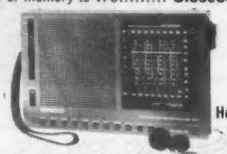

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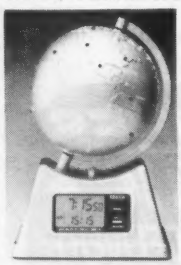

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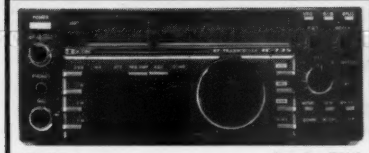

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It's a Dangerous Obsession

Growing up and learning about electronics is like driving a car before you can reach the brake pedal. KB4YJ tells how he lived through it.

Growing up in a small town in West Virginia was hard, especially for a kid like me who was always trying to find out what made things work. I wasn't satisfied with just reading or hearing about something; I had to see for myself. This meant tearing apart everything I could latch onto and drag home.

The kids my age thought I was weird. They were content with bouncing a basketball or tossing a baseball around all day. As for me, I preferred to spend a nice afternoon dissecting an old five-tuber on the kitchen table.

Most of the adults around me frowned on this unusual behavior, too. They would say things like, "That boy's gonna get shocked to death some day if he keeps on."

My mom was always warning me about the dangers, too. She was always telling me to stay away from things like golf balls or flashlight cells which were full of acid, or vacuum tubes which contained deadly poison. It seemed like all the neat things were booby-trapped in one way or another to take care of any knucklehead who tried to pry them open.

My dad encouraged me, though. He would say, "You keep on tearing up things, boy, and someday you'll make good."

My uncle Howard was understanding, too. He was the town's "trash man." Once a week he would bring his big truck around to collect the garbage. He saved anything he thought I would like and placed it in a special pile in the front of the truck. That pile was a gold mine to me. Clocks, fans, motors, old radios, and many other goodies were there to greet me when he came. I would pack it in, tear it apart, and he would get most of it back the following week.

I saved a lot of parts back then, even though I didn't know what they were. Every now and then I would get some of them out and say, "Gee, aren't those neat," even though I didn't know what I was going to do with them. (I still do that today, especially when I've just returned from Dayton.)

I was kind of short in the way of tools, having only a screwdriver, bicycle pliers, a pocketknife, and a big nail that I heated on the gas stove for soldering. This made it rough getting some things apart. A lot of the stuff was held together with ¼-inch hex-head screws. The people who made these must have known there would be someone like me gnawing them out with pliers someday.

My tool arsenal expanded greatly when my older brother brought me a soldering gun one Christmas. I was still pretty young at the time, so Mom envisioned the house burning down. She let me keep it, though, after a little nudge from Dad. Well, I didn't burn the house down, but I did lose a few shirts, a pair of pants, and a bedspread due to burn holes.

By the time I was nine, I had learned enough to think I could start fixing things. As I soon found out, folks were not exactly anxious to let a nine-year-old work on their radio or television. So, my first clients were some friends at school. They would bring their watches to me and I would take out a few parts which made the hands run around the dial real fast. Sometimes their parents made them return the watch for me to undo. Did you ever try to get all those gears to go in their holes while you put the two halves back together?

Later on in my youth I did acquire some friends who enjoyed the things I did. One such friend and I decided to build a telegraph system from my house to his about four blocks away. We started by building the sending and receiving apparatus. The sending key was easy, made from one of the "I's" out of a transformer core nailed to a block of wood. The receiver was another story. The only power source we had was the wall outlet, so we would wind a nail with a mile of wire out of an old television focus coil, plug it in, and when the smoke cleared, wind two

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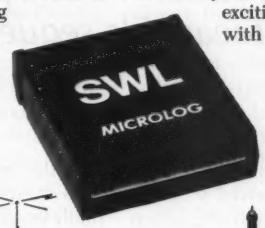

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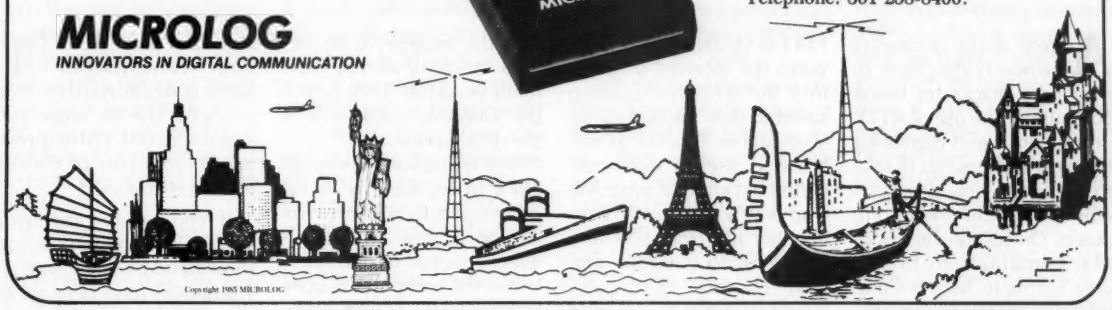

miles, and so on. We finally settled on a wad of wire which lasted about 15 seconds before incinerating. We agreed that this would work if we learned to send code fast enough.

Next came the running of the telegraph line, which was the rest of the focus coil. We didn't have a tall ladder, nor did our homemade pole-climbing shoes help us when we tried to string the wire over the existing telephone poles. So we just threw the roll over one pole and then the next. This method didn't work, to say the least. First the roll didn't fare too well because we didn't always catch it on the other side. Then we ran out of wire about a block short and gave up. For the next few days the neighbors complained about the "hair" wire someone left hanging about neck level around there.

A few months later we had perfected the telegraph sets. By using lantern batteries the coil didn't burn up anymore, and we had found something to use for the lines. This something was the gas and water lines which were right under our noses all along. It stood to reason that the two were metal and they both were connected between our houses, so the test came one night. I had the sending end armed with two almost fresh 6-volt lantern batteries and the key connected to the gas and water lines, respectively. I got on the phone.

"Are you ready on your end?"

"All set here."

"OK, key is down; did you get it?"

"Nothing here."

I checked connections and tried again; still nothing. The only thing I could think of was that the batteries were too weak to go all that way. So I went to the next most powerful source, the good old wall outlet. After installing a line cord, I was ready for another test.

"OK, you should get it this time."

I closed the key . . . wham! I was sitting in the dark. There were only two fuses in the whole house. Back to the phone.

"Gee, it acts like a dead short!"

We gave up for lack of more fuses and the fact that Dad was home at the time. Being as smart as I was, it didn't take long to figure out what went wrong. I surmised that somewhere between my house and his the gas and water lines crossed each other and there was the short!

As I became older, I soon discovered there really were hidden dangers in the things I worked on. Like when I grabbed hold of my first 5U4G to unplug it and learned about second-degree burns first-hand! A lesson was provided when I pulled the high-voltage anode lead out of a picture tube without first discharging it. The sharp high-voltage cage on which I left curly-cues of skin as I got away from the picture tube was equally terrifying.

Some of the things I did left lasting impressions, such as the time I built my first power supply, 350 volts at 200 mA, and laid my hand on the power transformer to see how hot it was while holding the B+ lead in the other hand! For awhile, I thought the folks were right about getting shocked to death!

Somehow I survived being a kid. I did a lot of unusual things and had a lot of fun back then. Now I'm all grown up and have two boys of my own. And Dad, I haven't exactly made good yet, but I'll pass the good advice along to my sons and maybe someday when I'm left sitting in the dark, I'll remember you and the time when I was a kid. ■

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Convert and Converse

Transform your C-64 Basic programs into Hamtext-readable sequential files.

A great many amateurs are now finding room in their ham shacks for home computers. The use of RTTY on the ham bands is growing by leaps and bounds thanks to the many new programs now available for these computers. One of the most popular combinations in this area seems to be the Commodore 64 and Hamtext™ by Kantronics. Which brings us to the subject of this article.

Did you know that you can use Hamtext to transmit programs over the air in ASCII? In the ensuing paragraphs, we will attempt to instruct you in our method of sending and receiving a usable program over the air and how to convert the resultant sequential file back into that program again.

"Convert" was designed to be used with Hamtext, a Commodore 64, and the 1541 disk drive. Hamtext stores the received program in a buffer, which, when saved to disk, becomes a sequential file. This file, as you know, is useless until converted back into a program. Convert will take this sequential file from disk and convert it to a usable program. For those of you who want to get into the meat of this program and could care less how it works, we will get right into the basic instructions. For those who care, we will explain the whys and wherefores of the program after the instructions.

Instructions

Before getting on the air, a few preliminaries are in order. You must convert the program that you are going to send into a sequential file and save it to disk. This must be done before loading Hamtext. While still in Basic, load the program to be sent into memory as you normally would do. Then type in the following commands in the direct mode:

```
OPEN 8,8,8,"name,S,W":CMD8:LIST
```

then press Return. A sequential file will now be written to disk with whatever name you have chosen. When the computer is done writing, type CLOSE8 in the direct mode and press Return. This will close the file and stop the disk drive. Now you are ready to load and run Hamtext. From the menu select the T/R options and set them as follows:

A. USOS	Off
B. Diddle	Off
C. Audio Feedback	Choice
D. Auto ID	Off
E. Wraparound	Off
F. Auto CR	Off
G. Auto LF	Off
H. TU	Whatever

This setup is very important. Do not forget to set your options in this manner before you start or you will find your program full of carriage returns and other strange things that do not belong there. When the time comes to transmit your program, have the receiving station stand by and return to receive mode.

Type the following in the transmit buffer (with no spaces):

```
Control-FD:nameControl-F
```

and then press F2 to begin your transmission. (The name is, of course, the name you gave the file when you saved it to disk.) After pressing F1, your part of the operation is now over.

If you are the receiving station in this operation, you should also be sure that your T/R options have been set as instructed. When the sending station informs you that it is ready to send the program and stands by for a moment, you should now press F8 and clear your buffer. This simple task will save you a lot of work later on.

After receiving the program, go to the edit buffer mode and delete anything not relevant to the program. The buffer should start with the number of the first line of the program and continue to the end. At the end of the last line in the program, you should see a reverse M. You must add a Control-C after the reverse M. This should appear on the screen as a reverse C. If you didn't clear your buffer before you started, you know by now why you should have! You probably have worn out your delete key getting rid of all the garbage. At this point, make sure that no line number in the object program is above 63769 or you will cause the Convert program to crash. It starts at line num-

```
63770 GOTO 63850
63780 PRINT"IF YOU WISH TO DESTROY THE CONVERT PROG. ENTER GOTO 63790":END
63790 PRINT"<CLR>";:FOR X=6377 TO 6398:PRINT X*10;:NEXT:PRINT X*10;:END
63800 D$=STR$(C):E(1)=VAL(MID$(D$,2,2)): E(2)=VAL(MID$(D$,4,1))
63810 E(3)=VAL(MID$(D$,5,1)):E(4)=VAL(MID$(D$,6,1)):Y=1
63820 FOR Z=681 TO 684:POKE Z,E(Y):Y=Y+1:NEXT
63830 RETURN
63840 Z=681:C=PEEK(Z)*1000+PEEK(Z+1)*100+PEEK(Z+2)*10+PEEK(Z+3):RETURN
63850 INPUT"<CLR><DWN><DWN>FILE NAME";F$:PRINT"OK. NOW LOADING BUFFER.
      PLEASE WAIT."
63860 OPEN 1,8,8,F$:B=49152
63870 GET #1,A$
63880 A=ASC(A$):POKE B,A:B=B+1:IF A=3 GOTO 63910
63890 IF ST=0 GOTO 63870
63900 CLOSE 1:PRINT"DISK ERROR";:OPEN 15,8,15:INPUT #15,C$,D$:PRINT
      C$,D$:CLOSE 1:CLOSE 15
63910 CLOSE 1
63920 PRINT"<CLR>":C=49152:GOSUB 63800
63930 PRINT"<CLR>":PRINT""
63940 GOSUB 63840
63950 A=PEEK(C):C=C+1
63960 PRINT CHR$(A);:IF A=3 THEN PRINT"<UP>OK.":GOTO 63780
63970 IF A=13 THEN GOSUB 63800:GOTO 63990
63980 GOTO 63950
63990 FOR X=631 TO 634:POKE X,13:NEXT:POKE 198,4:PRINT"GOTO 63930<HOM>";
```

The Convert program.

ber 63770 and will be overwritten by the object program. If this problem should occur, you will have to delete the offending lines and add them later when in Basic. This should not be too big a problem since line numbers seldom run this high in a program. If you are the transmitting station and your program does have these high line numbers in it, change them now and save the other fellow a lot of time.

After editing your buffer, save it to disk. Later, when you go off the air and return to Basic, load and run Convert. You will be prompted to enter the name of the file. Convert will then go to the disk, get the file, and begin to create a program from it. You will now see each line appear on the screen as it is entered. This is quite fast, so look quick.

If all goes according to plan, you will see a prompt informing you that the program is now complete. You will also be given a line number to GOTO that will list all the line numbers of the Convert program on the screen. With the aid of the cursor keys, move the cursor to the top of the screen and press Return on each of these numbers. When you reach the bottom, you will have deleted the Convert program from memory. If you now run a LIST, you should see your new program ready to save to disk. As with all programs, you should save it first before debugging it. After all this, who wants to lose it now!

There is a remote chance, even after following the instructions carefully, that you could encounter a few minor problems. They could be caused by the fact that we are not very good at giving instructions. (Come to think of it, we are not very good at taking instructions, either!) Or they could be caused by the old line-too-long problem. Sometimes a program line can have more than 80 characters. Any line that is over two screens long will mess things up.

How can this happen? When originally entered, the writer used the Commodore shorthand and thus kept within the two-line limit. Later, when the listing was converted to a sequential file for transmission, the words were extended out and over the limit. This might be something for the transmitting station to look for back in step one. Or you, as the receiver, while still in Hamtext, could look for this when editing the buffer before saving it. If you look for it there, you can break the line up into two lines.

If still in Hamtext, you won't be able to use the shorthand symbols except for PRINT. Very often you will be able to delete the PRINT command and use Commodore's shorthand, the question mark. This will save you four spaces, and sometimes that's enough.

Sometimes you will miss these lines and when running Convert, the program runs into them and stops. Now what? If line GOTO 63930 is still on the screen, run your cursor up to it and press Return. If not, just enter GOTO63930 in the direct mode and press Return. Things should pick up right where they left off.

Pay particular attention and note the next line number to be entered. When done, check the line before it. A small part of this line will be missing and you will have to find out what it is and replace it. The only way to find out, if you don't know, is to load up Hamtext and load the file back into the buffer. When you find the line in question, write down the missing information and enter it later when you return to Basic.

Whys and Why Nots

After studying a routine for changing sequential files to programs using a dataset, we determine that this procedure would not work with a disk drive. The dataset routine simply reads one line of the program from the sequential file off the tape, stops the tape, and then prints that line to the screen and enters it into the program. It then restarts the tape, which is in position to read the next line, and executes the same thing over and over until the end of the file.

The problem with a disk drive is that when you break the program to enter a line, the act of entering a line resets all variables and the disk returns to the start of the file. Thus we would just enter the first line of the program over and over.

We can't count the number of lines into the program because of the variable reset. Also, reading the program from the beginning after each line would be very time consuming. Convert starts by opening the file on the disk, reading it one bit at a time, and POKEing its ASCII value into high memory (49152) where it is a little more accessible and workable than on the disk. Each ASCII value is tested for a three, which is the Control-C (indicating the end of the file), that we entered back in Hamtext.

It should be mentioned at this point that POKEing the file into high memory, starting at 49152, limits you to programs of 4K or less. This equates to 16 blocks on a 1541 disk drive. Longer programs can be entered by breaking them into two or more parts and saving them to disk under different names. Then, using the combine feature of the COPY command found in your 1541 user's manual, you can combine them into one program.

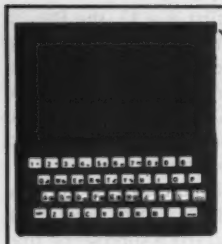
After POKEing the sequential file into high memory, it is read and printed back to the screen one character at a time. While doing this, Convert is testing each character, looking for flags. The first is a 13, the Return command, indicating the end of a program line. The second is a three, the Control-C we affixed at the end of the file to signal the end of the program.

When a Return is encountered, we GOTO line 63800. This starts a subroutine that disassembles the variable C and stores it in low memory. C is the address of where we are in the sequential file that is stored in high memory. Moving right along to line 63990, we POKE four Return commands into the keyboard buffer (memory locations 631 to 634) and POKE a four into memory address 198 to tell the computer they are there. Then, before ending the program, we print a GOTO 63930 command below the program line we have just printed on the screen. We then end the program with a cursor HOME command.

Now the program has supposedly ended and the cursor is positioned at the top left of the screen just above the program line that is to be entered. But wait, what's this? The keyboard buffer still has four commands waiting to be executed!

The first Return places the cursor on the program line and the next causes that line to be entered into memory. The third Return executes the direct GOTO command which was left on the screen by the print portion of line 63990. This then puts us back into the program in line 63930, clears the screen, and we are off and running again.

In line 63940 we go to subroutine 63840. This routine PEEKs the low memory where we stored the value of C and reestablishes the address of where we are in the sequential file. This loop will continue in this manner until an ASCII 3 is encountered. The Control-C or ASCII 3 flags the end of the program. But wait! What happened to the fourth Return that was POKEd into



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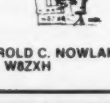

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the keyboard buffer? Nothing. It was only put in as an extra to ensure that the cursor reached the direct GOTO command.

A prompt on the screen now tells you to GOTO 63790 if you wish to destroy the Convert part of the program. Going to 63790 causes the program to list all the line numbers on the screen. It is now a simple matter to press the Return key on each of the numbers and remove the lines from memory.

The Fine Print

Some of the commands in Commodore's Basic are not retransmitted by Hamtext. This includes most of the graphics and the CLR command. These inconveniences will have to be dealt with individually. The CLR command will come through as a HOME command. Usually, with a little scrutinizing of the program, you can decide which it should be.

Other commands to watch for are cursor up, down, left, and right. Hamtext will ignore these and leave them out of the transmission. The best way we have found to get around this problem is to replace all the symbols in the program with bracketed commands such as <CLR> for clear screen or <CUR/UP> for the cursor up token. Then save the program to disk as a sequential file to be transmitted later. If you take a little time to prepare your files in this manner, the person receiving it on the other end will then be aware of what the command should be and can correct it in his final program.

This system has been working well for us. It does require a little setup time on your end, but we think you will be pleased with the results. it won't be long before you have several disks full of sequential file programs ready to transmit to other hams. ■

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MRF449,/A	30W	12.50	30.00
MRF450,/A	50W	14.00	31.00
MRF453,/A	60W	15.00	35.00
MRF454,/A	80W	16.00	36.00
MRF455,/A	60W	12.00	28.00
MRF458	80W	20.00	46.00
MRF460	60W	18.00	42.00
MRF464*	80W	25.00	60.00
MRF466*	40W	18.75	48.00
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MRF476	3W	2.75	8.00
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MRF234	25W	66-88	15.00	39.00
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MRF238	30W	136-174	12.00	—
MRF239	30W	136-174	15.00	—
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2N6080	4W	136-174	6.25	—
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Ends: 0300 UTC November 3
PHONE
Starts: 2100 UTC November 16
Ends: 0300 UTC November 17

US and Canadian stations work other US and Canadian stations using 1.8- through 28-MHz bands. Operate no more than 24 of the 30 hours with on/off times noted clearly in your log. Listening time counts as operating time. Operating categories include single operator and multi-operator with a single transmitter.

No crossmode contacts, and each station can be worked only once regardless of frequency band. A transmitter used to contact one or more stations may not subsequently be used under any other call during the contest period (with the exception of family stations where more than one callsign is assigned by FCC/DOC). One operator may not use more than one callsign from any given location during the contest period. The use of two or more transmitters simultaneously is not allowed.

EXCHANGE:

Consecutive serial number, precedence (A if you run 150-Watt output or less, B if more than 150 Watts), your callsign, check (last two digits of the year you were first licensed), and your ARRL section.

SCORING:

Count 2 points for each completed 2-way QSO. Multipliers are each ARRL section plus VE8/VY1 (74 maximum). KP4, KV4/KP2, and KG4 stations are in the West Indies section, while KH6 and other US possessions in the Pacific count as the Pacific section. Final score is QSO points

CALENDAR

Nov 2–3	**ARRL Sweepstakes—CW**
Nov 2–3	**ARRL EME Competition—Part 1**
Nov 2–3	**IPA Contest**
Nov 9–10	**Delaware QSO Party**
Nov 9–11	**CQ WE Contest**
Nov 10	**International OK DX Contest**
Nov 16–17	**VK Versus The World CW QRP Contest**
Nov 16–17	**ARRL Sweepstakes—Phone**
Nov 23–24	**ARRL EME Competition—Part 2**
Dec 7–8	**ARRL 160-Meter Contest**
Dec 14–15	**ARRL 10-Meter Contest**
Dec 26–Jan 1	**QRP Winter Sports—CW**
Jan 11	**73 40-Meter World SSB Championship**
Jan 11–12	**Hunting Lions In The Air Contest**
Jan 12	**73 75-Meter World SSB Championship**
Jan 18–19	**73 160-Meter World SSB Championship**
Jan 25	**73 15-Meter World SSB Championship**
Jan 26	**73 20-Meter World SSB Championship**

RESULTS

K3TUP, 40-meter multi-op champion for the third consecutive year.

40-meter DX single-op champion DJ3HJ.

KE5CV, K3TUP, I4KDJ, AND DJ3HJ: 1985 WORLD 40-METER SSB CHAMPS

This has been an unbelievable year on 40 meters. The defending multi-op World Champions, K3TUP and crew, captured their third consecutive title. Returning World Champion KE5CV scored a decisive victory in the single-operator class.

DX station I4KDJ, vying for its second world title in the multi-op category, managed to outscore its nearest competitor by nearly three to one. Earning his first World Championship for the single-operator class was DJ3HJ from West Germany.

Whew, what talent. These stations are not to be denied their place on the 40-meter Honor Roll.

40-Meter World Champions

	1982	1983	1984	1985
W/VE Single Op	VE5DX	KC5NQ	KE5CV	KE5CV
W/VE Multi-Op	N9NB	K3TUP	K3TUP	K3TUP
DX Single Op	YV5ANE	4M3AZC	KD7P/KH2	DJ3HJ
DX Multi-Op	I4YNO	I5NPH	I4KDJ	I4KDJ

Multi-band contests are won or lost on 40 meters. Top contesters openly admit that a respectable 40-meter operation will spell the difference between first, second, and third place. Is it any wonder that the 40-meter single-band event has become one of the most popular?

In the single-operator class, only 4 contacts separated KE5CV and K4XS at the finish. Multipliers decided the overall winner. KE5CV had 56 states/provinces and 47 DX countries to acquire a total of 103 multipliers. Totaling 91 multipliers, second-place station K4XS worked 53 states/provinces and 38 DX countries.

DJ3HJ won DX single-op honors by working 316 Qs, only 7 W/VE multipliers, and a whopping 84 DX countries. This multiplier total was more than his nearest competitor, Alaskan station KL7U, could muster. While KL7U worked 20% more stations than the champion, propagation just did not provide the overwhelming DX total yielded by the West German station.

Multi-op competition has never been greater. The crew at K3TUP set a new World QSO Record with 1381 QSOs in the 24-hour contest, surpassing last year's record of 1214. K3TUP literally walked away with their third World Championship. Second-place finisher KY0S was one short of matching K3TUP's multiplier total of 84. They could not, however, make up the difference of 242 Qs.

World Championship recognition seems to be due our friends in Italy. As the preceding chart illustrates, the DX multi-op title has gone to an Italian station since the beginning of this event. 1985 World Champion I4KDJ is an example. This is the second time this station has been awarded top honors for this contest category!

Championship competition breeds new world records. Let's take a look at QSO records for each operator class:

World 40-Meter QSO Records

Single Operator			Multi-Operator		
KE5CV	1985	1,200	K3TUP	1985	1,381
K4XS	1985	1,196	K3TUP	1983	1,214
W1WEF	1984	1,042	K3TUP	1984	1,196
KE5CV	1984	1,020	N4DDS	1985	1,151
N6YK	1985	1,012	KY0S	1985	1,139
KE5IV	1985	1,009	K8ND	1983	1,129
VE5DX	1982	972	N9NB	1982	1,098
KE5IV	1984	953	W2ZQ	1985	1,084
NC2V	1985	931	K9EC	1984	1,008
K9EC	1985	915	WA4JXI	1985	990

As usual, Canadian multipliers were at a premium. Too bad the VEs don't support this championship event more than they do. Stations with 50 or more states and provinces to their multiplier credit include: WA4JXI (57), K5LZO (56), KE5CV (56), K0HA (56), N6YK (55), K3TUP (55), KY0S (55), KS9O (55), N4DDS (54), NC9F (53), WA6PVA (53), K4XS (53), KE5IV (53), K9EC (53), N9GT (53), N8CXX (53), NC2V (52), KA1GG (52), VE3MFP (52), WB7APW (52), WD5GSL (52), KB0C/9 (51), AE5H (51), W4TMR (51), W2ZQ (51), W9UCW (50), K1KJT (50), and KQ1F (50).

Stations with 30 or more DX countries include: DJ3HJ (84), I4KDJ (65), I4AVG (48), KE5CV (47), K4XS (38), N6YK (38), WA4JXI (32), KE5IV (30), and K3WGR/VP2 (30).

As we looked over the contest entries, we thought it would be interesting to note the various antenna combinations being used in this event:

ANTENNAS USED (%) IN THE 40-METER CONTEST

33	Inverted vee/dipole
15	Vertical
12	2-element yagi
9	3-element yagi
8	4-element yagi
5	Delta loop
4	Longwire
3	¼-wave sloper
3	½-wave sloper
3	Wire beam
2	2-element quad
2	Phased vertical
1	Log periodic

Reviewing the antenna survey, we can see a definite trend toward more sophisticated arrays. While inverted vees and dipoles remain the overall mainstays, the monobander appears to be a must if you want to be in the top five! *(KE5CV called me the other evening and convinced me to replace the 2 element with a third rod! Guess what? He and NE6I were right; it's worth it!—KE7C).*

Have you ever asked yourself what makes a championship station? We thought we'd share the descriptions of this year's top five stations in each operator class. Of course, it doesn't hurt to have a seasoned operator at the helm either:

Single Op:				
KE5CV	TX	TS-930	Alpha 76PA	4-el KLM, wires
K4XS	FL	TS-930	Alpha 78	4-el KLM, inverted vee
N6YK	CA	TS-930	Alpha 77D	4-el KLM
KE5IV	TX	TS-930	Alpha 77D	4-el KLMs stacked
NC2V	NJ	TS-930	TL-922	4-el KLM
Multi-Op:				
K3TUP	PA	TS-930	Alpha 77D	4-el KLM, dipole
WA4JXI	FL	TS-830	TL-922	2-el yagi, sloper
N4DDS	TN	FT-902DM	Drake L-7	Longwire
KS9O	IL	IC-751	IC-2KL	3-el KLM
I4KDJ	Italy	TS-930/FT-901		Phased verticals

Note: KY0S was second-place multi-op but we do not have his station description.

On behalf of our 40-Meter Contest chairman, Dennis Younker NE6I, I want to thank all those who participated in this year's event. Many of you didn't turn in an entry and that's unfortunate. If you had, perhaps you could have earned a contest award. Please, next year, just take a few moments, put together your entry, and send it in. You'll be glad you did.

Speaking of next year, the 1986 40-Meter World Championship Contest is scheduled for 0000–2400 UTC, January 11, 1986. The rules are already printed and available right now! This year we have a special address for ALL CONTEST RULES AND FORMS. If you inquire about one contest, you'll receive rules and forms for all our single-band events. Send an SASE to: *1986 Contest Rules and Forms, Billy Maddox KA3JJK/3, 1162 Bayview Vista Drive, Annapolis MD 21401.*

Though many of you were not able to earn an award, you made achievements in other ways I hope. Perhaps you contacted that 50th state or added another DX country to your totals. You're all worthy of honorable mention and we appreciate your dedication to this annual contest. Please ask your friends to join us in the 1986 contest. Thank you for your support and see you on 40!—*Bill Gosney KE7C.*

40-Meter Soapbox

KA2IEU (W2ZQ op)	Learned every dirty trick we know from W3BGN! Hi, Hi.
N3BJ (K3TUP op)	Excellent way to get away from XYL after a New Year's hangover.
N4DDS	Lost 30 minutes of operating time handling emergency traffic for WA3TAI and the NTS.
N4GTU	Great contest with excellent propagation here on the East Coast.
W4TMR	Always a great contest. I'm looking forward to next year.
K4VKZ	Amp burned up. Blew flames out and continued running barefoot. *(Ed. note: Talk about dedication!)*
WD5GSL	Why would two otherwise normal guys spend ten hours in an uninsulated trailer (ham shack) in the middle of a cow pasture just to freeze their buns off? To operate the 40-Meter World Championship, that's why!
WA5IYX	Record snowstorm here began about 0600Z and provided considerable distraction for the remainder of the contest.
KC7PA	Doubled last year's score. Daytime activity was way up this year.
N8CEO	Had lots of fun. No bowling next year so I can devote all my time to the event.
N9DHX	Enjoyed working Oregon and Arizona for the first time operating QRP.
NC9F	24-hour format is great. You can operate a contest and still have a weekend.
N0CLV	First time in the contest. Had a great time. See everyone again next year.
VE3MFP	High-tension wires (300 kV) 400 feet away started to arc. What a noise level!

times the number of ARRL sections (plus VE8/VY1).

FREQUENCIES:

CW	Novice	Phone
1800–1810		1855–1865
3550–3650	3710	3850–3950
7050–7100	7110	7200–7250
14050–14100		14250–14300
21050–21100	21110	21300–21400
28050–28100	28110	28550–28650

AWARDS:

Certificates to the top single-operator CW and phone scorers in both the A and B categories in each ARRL section, and the top multi-operator entry in each ARRL division.

ENTRIES:

Contest forms (log sheets, summary sheet, dupe sheet) are available from ARRL headquarters for an SASE. Official forms are recommended. Any entry claiming more than 200 QSOs must submit duplicate checking sheets. Incomplete or late entries will be classified as check logs. Logs should include dates, QSO times, exchange sent/received, band, and mode. Postmark your entry for either mode by December 21st. Send to ARRL, 225 Main Street, Newington CT 06111.

Each entrant agrees to be bound by the provisions as well as the intent of the official ARRL rules, the regulations of his licensing authority, and the decisions of the ARRL Awards Committee. Usual disqualification rules apply.

ARRL INTERNATIONAL EME COMPETITION
November 2 and November 3
November 23 and November 24
Full 48-hour-UTC period each weekend

The object of this contest is to establish two-way communications via the earth-moon-earth path on any authorized amateur frequency above 50 MHz. Fixed or portable operation is permitted. However, stations operating outside their traditional call areas must indicate the call area being used. Stations may be worked only once per band regardless of which weekend contest period.

Contacts may be on CW or SSB but only one signal per band is permitted. Any transmitter, receiver, or antenna used to contact one or more stations under one callsign may not be used under any other callsign during the contest except for family stations where more than one call has been issued. In that case, contacts are valid only if the second callsign is used by a different operator.

There are no specific minimum terrestrial distances for contacts as long as all communications are copied over the moonbounce path, regardless of how strong or weak a nearby station's terrestrial signal may be.

Operating categories are broken down into single and multiband single operator, multi-operator, and commercial equipment stations. Single-operator stations must use only one person for all operating and logging functions, equipment adjustment, and antenna alignment. Single-band single-operator entries on 50, 144, 220, 432, and 1296-and-up categories will be recognized in awards offered. Contacts may be made on any and all bands without jeopardizing single-band status. Such additional contacts are encouraged and should be reported.

Multi-operator stations are those stations using two or more persons, including neighboring amateurs within one call area but with EME facilities for different bands on different team members' premises, as long as no two are more than 50 km (30 miles) apart. Multi-operator neighborhood groups cannot use the same callsigns at each location; all calls will be listed in the results.

Stations using equipment that is not amateur (such as a disk antenna for lab equipment owned by an institution or government agency) will have their scores listed separately in this category.

EXCHANGE:

For a valid contact, each station must send and receive both callsigns and a signal report in any mutually understood format plus a complete acknowledgement of the calls and report. Partial or incomplete QSOs should be indicated in your log, but not for contest credit.

SCORING:

Each contact counts 100 points. Multipliers are each US state and Canadian call area, plus each DXCC country worked on each band. Final score is the sum of the QSO points times the total multipliers from all bands.

AWARDS:

Certificates will be issued to the top five stations worldwide in each entry category. Additional awards will be issued where significant achievement or competition is evidenced. In addition, each station that successfully completes at least one EME contact during the contest period will receive a certificate commemorating that achievement.

ENTRIES:

All entries must be postmarked no later than 30 days after the contest and must include complete log data. Your summary sheet should show a band-to-band breakdown of QSOs and multipliers and include details of your station setup and a photo. Usual disqualification rules apply. Address entries to ARRL Headquarters at 225 Main Street, Newington CT 06111.

IPA CONTEST
CW—November 2
0600–1000, 1400–1800 UTC
SSB—November 3
0600–1000, 1400–1800 UTC

Sponsored by the International Police Association to enable participants to work for the Sherlock Holmes Award and trophy. The contest is open to all radio amateurs and SWLs the first weekend in November each year. Entry classes include single- and multi-operator stations as well as SWLs. Use all bands from 80 to 10 meters (without WARC bands). Each station may be worked once per band.

EXCHANGE:

RS(T), QSO number, "IPA" if IPA member, and state for USA stations.

FREQUENCIES:

CW—3575, 7025, 14075, 21075, 28075.

SSB—3650, 3775, 3800, 7075, 7100, 14295, 21295, 28575.

All frequencies ±25 kHz.

SCORING:

Every completed QSO counts one point, or five points if with an IPA member or club station. Multipliers are the number of DXCC countries and US states where IPA members are worked. Final score is QSO points per band multiplied by mulitplier.

AWARDS:

Certificates to the three highest scoring stations, both member and nonmember, amateur and SWL. Any radio amateur fulfilling the conditions of the Sherlock Holmes Award or trophy may apply with the contest log sheet without a GCR list. However, each SHA and SHT requires the normal award fee.

ENTRIES:

Entries must be postmarked no later than December 31 and addressed to: Anton Kohten DK5JA/DKØIPA, PO Box 40 01 83, D-1452 Kempen 1, West Germany. Official contest logs are available from the same address for 2 IRCs.

1985 RESULTS

40-Meter World SSB Championship Contest

Indicated are callsign, QTH, QSOs, states/provinces worked, DX worked, and total score.

** World Champion * State, Provincial, or Country Champion

Two-time 40-meter single-op champion KE5CV.

W/VE Single Operator

**KE5CV	TX	1,200	56	47	704,520
* K4XS	FL	1,196	53	38	567,840
* N6YK	CA	1,012	55	38	539,400
* KE5IV	TX	1,009	53	30	443,635
* NC2V	NJ	931	52	20	344,520
* KØHA	NE	813	56	24	338,000
* K9EC	WI	915	53	15	317,560
* KA1GG	MA	804	52	21	303,680
K1KJT	MA	778	50	15	257,725
KQ1F	MA	739	50	13	236,565
* N9GT	IN	767	53	8	236,375
* VE3MFP	ONT	479	52	31	227,420
* N8CXX	MI	600	53	13	202,620
KBØC/9	IN	612	51	13	200,960
* AE5H	MS	480	51	7	142,680
K4VSK	FL	454	49	11	139,800
* N4JII	TN	552	47	2	137,200
* WB7APW	AZ	403	52	9	132,370
* W4TMR	NC	387	51	11	124,000
* N3DED	PA	477	44	2	110,400
* WA1BBB	NY	470	44	2	108,330
K8JM	MI	424	46	4	107,000
* W1WEF	CT	420	49	1	105,250
* AK1A	NH	388	41	11	103,740
KVØI	NE	391	49	2	100,215
* KDØHY	IA	349	49	7	99,680
* KA1SR	RI	354	44	10	98,820
* N4KWX	VA	387	45	4	96,040
* KB8AC	IL	316	48	10	95,410
* KI4XB	GA	341	46	5	88,230
NF4F	TN	361	42	3	81,900
* KC7PA	UT	299	43	7	77,000
* KD7SP	NV	266	44	10	75,330
* W5TTE	NM	257	44	11	74,800
WA6FGV	CA	317	39	4	69,445
KB9S	WI	268	44	6	68,500
* NS5Z	LA	258	44	5	64,435
WBØKX/4	GA	192	43	12	61,600
W3ARK	PA	281	38	1	54,990
NB9P	IN	233	41	1	48,935
* KD8PT	WV	172	42	4	47,840
* WA2HFI/Ø	MN	215	38	4	45,990
WBØBHF	IA	186	45	3	45,120
* KB7M	WY	211	39	2	43,665
WA2YLY	NJ	182	38	5	42,075
AF1T	NH	200	36	4	41,000
* VE2YU	QUE	160	40	7	39,480
N5HFR	TX	153	42	4	37,260
* KS7T	MT	157	40	4	35,860
KB7WN	WY	166	41	1	35,070
WA5IYX	TX	134	40	8	34,560
* WØIZV	CO	143	44	2	33,350
* AGØM	ID	139	37	6	31,175
* NØCLV	KS	132	42	1	28,595
N8CEO	MI	124	43	2	28,350
NE6I	CA	125	37	5	27,300
KB6ATI	CA	179	25	3	25,480
WØNGB	MN	117	40	2	24,990
KB8KW	WY	117	41	1	24,780
W4WIJ	FL	112	39	4	24,725
VE2DTI	QUE	104	41	4	24,525
W8VEN	WV	111	37	5	24,360
N8BJQ/6	CA	104	30	9	23,400
NE2W	NY	93	30	11	22,260
* N5AFV	OK	107	38	2	21,800
* VE1BDT	NS	114	33	3	21,060
K8KUH	MI	100	36	2	19,380
N4GTU	VA	93	35	1	16,920
* W3SOH	VT	100	30	1	15,655
WK4F	FL	76	31	6	15,355
N4TG	TN	105	29	0	15,225
N4UH	NC	76	32	3	14,000
W4TWW	SC	58	36	6	13,440

N9DHX/QRP	IN	76	35	0	13,300
K2SCV/5	TX	66	27	6	11,880
W9LYN	IL	49	23	4	6,615
NJ8L	OH	42	17	4	4,830
WA8GLF	OH	38	18	0	3,420
K8CV	MI	29	18	3	3,360
NS6Y	CA	30	16	1	2,635
N8AXA	OH	21	12	0	1,260
KY9F	IL	18	7	1	720
KA9GHT	VT	10	5	0	250

DX Single Operator:

**DJ3HJ	West Germany	316	7	84	284,375
* KL7U	Alaska	392	34	21	187,000
* K3WGR/VP2M	Montserrat	368	47	30	176,715
* I4AVG	Italy	183	1	48	89,180
KF7S/KL7	Alaska	417	1	13	58,310
* YV5JEA	Venezuela	142	36	19	48,950
* EA3CCN	Spain	136	9	27	47,340
* KF6ME/DU2	Philippines	200	4	20	45,960
* HR1FC	Honduras	161	37	5	34,860
* ZF2GO	Cayman Islands	128	42	4	30,590
* 4U1UN (HB9RS)	UN HQ	131	34	3	24,790
* AH6FL	Hawaii	116	23	9	20,480
YU3CK	Yugoslavia	85	0	24	20,200
LZ1KKA	Bulgaria	84	0	21	17,640
YV6BTF	Venezuela	62	28	12	16,800
LX1RQ	Luxembourg	82	0	19	15,580
JL1MWI	Japan	78	8	15	13,110
G3GUP	England	71	0	17	12,070
YU4EZC	Yugoslavia	57	0	20	11,400
JA9YBA (JA9VDA)	Japan	70	7	10	10,370
G4XTM	England	53	0	16	8,480
FE6BVB	France	35	15	10	6,375
JE4VVM	Japan	34	6	15	5,670
CT1TM	Portugal	34	0	13	4,420
OZ3ZK	Denmark	28	0	14	3,920
EA3PE	Spain	29	0	13	3,770
HL4CAE	Korea	55	0	6	3,300
EA3ELM	Spain	25	0	13	3,250
LZ1KOZ	Bulgaria	20	0	12	2,400
FE8WE	France	22	0	9	1,980
OK3YK	Czechoslovakia	23	0	9	1,035
JH1IAQ	Japan	16	4	8	1,680
PA3CEF	Netherlands	12	0	5	600
DL8AAM	West Germany	8	0	6	480
JA2BNN	Japan	8	0	5	400
JE1ARQ	Japan	8	3	2	275
OZ3KE	Denmark	6	0	3	180
JH3DEJ	Japan	3	0	3	90

W/VE Multi-Operator

**K3TUP	PA	1,381	55	29	597,240
* KY0S	CO	1,139	55	28	512,940
* WA4JXI	FL	990	57	32	468,585
* N4DDS	TN	1,151	54	12	385,770
* KS9O	IL	946	55	22	374,990
* W2ZQ	NJ	1,064	51	15	359,700
* WD5GSL	TX	905	52	21	342,005
K5LZO	TX	747	56	26	333,330
NC9F	IL	907	53	18	332,635
* WA6PVA	OR	701	53	21	280,090
W9UCW	IL	559	50	16	190,740
* N4FKF	IN	363	48	5	97,520
* WA6HRH	CA	183	43	11	52,110

DX Multi-Operator

**I4KDJ	Italy	490	2	65	327,630
* VK6IR	Australia	285	25	25	128,750
JA7YFB	Japan	92	15	23	19,075
JA2YKA	Japan	25	5	9	2,870

Multi-Op Participants

W2ZQ	KA2IEU, N2FFA, KD2EZ, WA2JZF, KD2JA, N2CBL, WB2IQV, KB1BD, KB2NB, WB2REM, and Karen.
K3TUP	K3TUP, KB8IZ, N3BJ
N4DDS	N4DDS, N4DRL, KA5TAG, WB9TKS, KA8GAF, WA4VTZ
N4FKF	N4FKF, KA9ORN
WA4JXI	WA4JXI, WA4SVO, K0OO
WD5GSL,	WD5GSL, WB0TEV, WD5ABC
K5LZO	K5LZO, KA5SBS
WA6HRH	KG6JC, KG6JE, N6KUY
WA6PVA	WA6PVA, NI7T, N7PGO
NC9F	NC9F, N9EEO, WB9IPW
KS9O	KS9O, NB9T, KA9DVY
W9UCW	WB9NUL, WA9MAQ
KY0S	KY0S, AD0O, N0EBM
I4KDJ	I4KDJ, I4JMY, I4YSS, I4OUT, I4ZNU, I4USC
JA2YKA	JF2DQJ, JR2GMC, JA9SSY, JI2NPL, and Mr. Asano
JA7YFB	JE7MLJ, JH0QNT, JN1RON, JR7JLU, JR7GYC
VK6IR	VK6IR, VK6DU

Check Logs: KW2J, K5GN, N0BQW

Disqualified: (late logs) Y32KE, Y37RA, Y54TA, Y23TL, Y43UC, Y23YK, Y34K; (excessive/incomplete entries) KA0QFY/4, K9JNB, KA4MTK, WA4BSN, WB0WHB; (excessive duplicates) WR4F

DELAWARE QSO PARTY
Starts: 1700 UTC November 9
Ends: 2300 UTC November 10

Sponsored by the Delaware ARC. Stations may be worked once per band and mode for QSO and multiplier credits.

EXCHANGE:

QSO number, RS(T), and Delaware county, ARRL section, or country.

FREQUENCIES:

CW—1805, 3570, 7070, 14070, 21070, 28070.

SSB—1815, 3975, 7275, 14325, 21425, 28650.

Novice—3710, 7120, 21120, 28120.

SCORING:

Delaware stations score 1 point per QSO. Multiply total by the number of ARRL sections and DX countries worked.

Others score 5 points per Delaware station worked. Multiply total by the number of Delaware counties worked on each band and each mode (maximum of 36 multipliers possible).

ENTRIES & AWARDS:

Appropriate awards will be given to the top scorers. In addition, a certificate to all stations working all three Delaware counties. If you work all three counties and want the WDEL Award, send two 22-cent stamps and an address label. Mail logs by December 15 to: Charlie Sculley AE3H, 103 E. Van Buren Avenue, New Castle DE 19720. Send an SASE for a copy of the results.

CQ WE CONTEST
1900 UTC November 9
to 0500 UTC November 11

This contest is open only to present and retired employees of Bell Operating Companies, Western Electric, AT&T, and subsidiaries of AT&T. For logs and complete rules, contact your local interworks coordinator or Warren Coleman WD4NIT, AT&T Technologies, 6701 Roswell Road, Atlanta GA 30328; (404)-257-7394 (work).

INTERNATIONAL OK DX CONTEST
Starts: 0000 UTC November 10
Ends: 2400 UTC November 10

Participating stations work stations of other countries according to the official DXCC country list. Contacts between stations of the same country count only for multipliers but have no QSO point value. Each station may be worked once on each band. Use all bands, 160 through 10 meters, on phone or CW. Crossband or crossmode contacts are not valid. Operating categories include: A—single operator all bands, B—single operator one band, C—multi-operator all bands. Any station operated by a single person obtaining assistance, such as in keeping the log, monitoring other bands, tuning the transmitter, etc., is considered as a multi-operator station. Club stations may work in category C only.

EXCHANGE:

RS(T) and 2-digit number indicating the ITU zone. *Please note the ITU zones are quite different from the ARRL zones!* For a list and map of the ITU zones, send 2 IRCs to the entry address listed below.

SCORING:

Each QSO counts one point, or 3 points if with an OK station. Final score is QSO points times the total number of ITU zones worked on each band.

ENTRIES:

A separate log must be kept for each band and must contain the full date. The

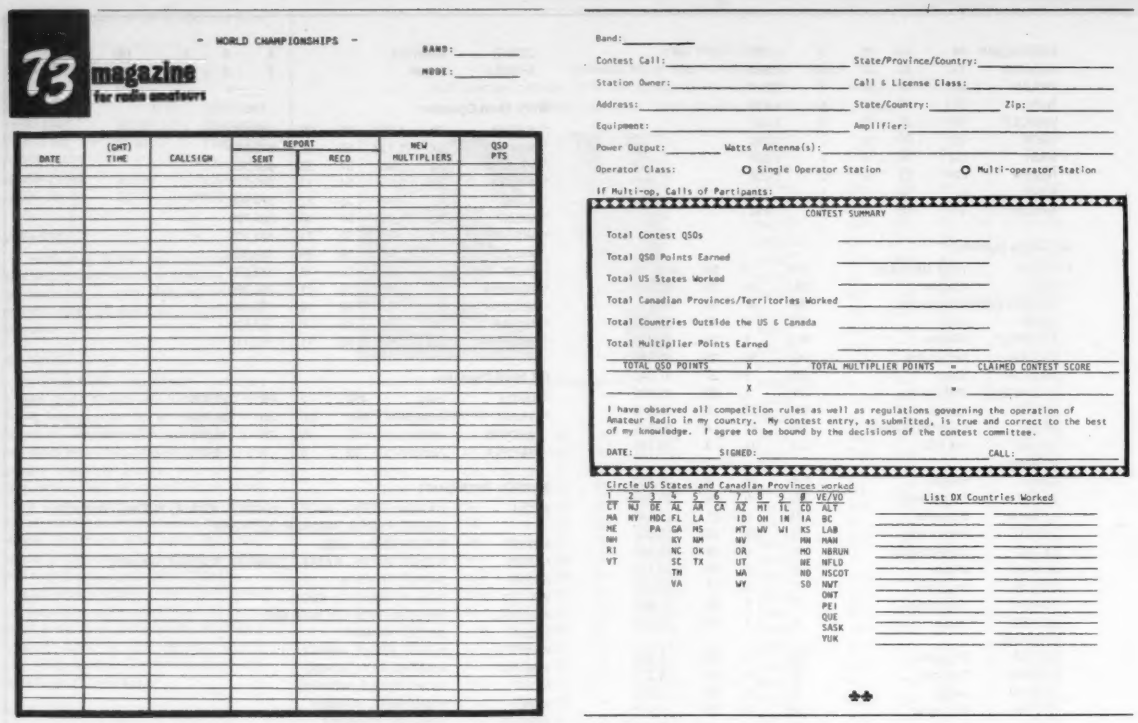
THE CHATTERING RELAY

NEWSLETTER OF THE MONTH

Tom Weiss WA8VSY is the Editor of *The Chattering Relay*, journal of the Cuyahoga Falls Amateur Radio Club (Ohio). We picked the *Relay* as this month's winner based on its fresh way of looking at things that too often become bogged down in a newsletter—financial woes, meeting announcements, etc.

Without becoming sappy, Tom covers the essentials in a lighthearted, fun-to-read style that makes the *Relay* hard to put down. Congratulations, Tom, and congratulations to the entire Cuyahoga Falls club.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, 80 Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.



73 magazine for radio amateurs

– WORLD CHAMPIONSHIPS –

BAND: _____

MODE: _____

DATE	(GMT) TIME	CALLSIGN	REPORT SENT	REPORT RECD	NEW MULTIPLIERS	QSO PTS

Band: _____

Contest Call: _____ State/Province/Country: _____

Station Owner: _____ Call & License Class: _____

Address: _____ State/Country: _____ Zip: _____

Equipment: _____ Amplifier: _____

Power Output: _____ Watts Antenna(s): _____

Operator Class: O Single Operator Station O Multi-operator Station

If Multi-op, Calls of Participants:

CONTEST SUMMARY

Total Contest QSOs _____

Total QSO Points Earned _____

Total US States Worked _____

Total Canadian Provinces/Territories Worked _____

Total Countries Outside the US & Canada _____

Total Multiplier Points Earned _____

TOTAL QSO POINTS X TOTAL MULTIPLIER POINTS = CLAIMED CONTEST SCORE

_____ X _____ = _____

I have observed all competition rules as well as regulations governing the operation of Amateur Radio in my country. My contest entry, as submitted, is true and correct to the best of my knowledge. I agree to be bound by the decisions of the contest committee.

DATE: _____ SIGNED: _____ CALL: _____

Circle US States and Canadian Provinces worked

1	2	3	4	5	6	7	8	9	0	VE/VO
CT	NJ	DE	AL	AR	CA	AZ	MT	TL	CO	ALT
MA	NY	MDC	FL	LA		ID	OH	IN	IA	BC
ME		PA	GA	MS		MT	WV	WI	KS	LAB
NH			KY	NM		NV			MN	MAN
RI			NC	OK		OR			MO	NBRUN
VT			SC	TX		UT			NE	NFLD
			TN			WA			ND	NSCOT
			VA			WY			SD	NWT
										ONT
										PEI
										QUE
										SASK
										YUK

List DX Countries Worked

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SPECIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

FEEDING HILLS MA
NOV 1

There will be a giant auction of radio/electronic/computer items by the Hampden County Radio Association on Friday, November 1, 1985, at the Granger School, Feeding Hills MA (intersection of Routes 57 and 187), beginning at 7:30 pm. Please bring items that you wish to sell and mark your name on each item. The sponsor will take a 10% commission on all sales. There is no admission charge. For further information, contact Ron Beauchemin at (413)-739-5228.

BRENHAM TX
NOV 1–3

A swapfest and garage sale will be held at the Washington County Fairgrounds in Brenham, Texas, from November 1 to November 3, 1985. Special-event station NS5N will operate on 21.125 and 21.360 MHz; a special QSL is available for an SASE. Send QSLs and inquiries to Gene Stanford KA5LEI, BARC, Box 44, Brenham TX 77833.

RICHFIELD MN
NOV 2

The Twin City FM Club will sponsor Hamfest Minnesota and Computer Expo on November 2, 1985, from 8:00 am to 3:00 pm, at Richfield High School, 7001 Harriet Avenue South, Richfield MN. Admission is $3.00 in advance, $4.00 at the door. FCC exams will be given. Talk-in on .16/.76. For more information, contact Clyde R. Green NØDVP, 5406 Zealand Avenue North, New Hope MN 55428, or the Twin City FM Club, PO Box 555 Minneapolis MN 55440.

STONE MOUNTAIN GA
NOV 2–3

The Alford Memorial Radio Club of Stone Mountain GA will sponsor Ham Radio and Computer Expo 85 (formerly the Stone Mountain Hamfest) on Saturday and Sunday, November 2–3, 1985, from 9:00 am to 5:00 pm on Saturday, and 9:00 am to 4:00 pm on Sunday. Admission is $5.00 at the gate, $4.00 in advance. FCC license exams will be given on both days. Talk-in on 146.16/.76 and 444.25. For further information or reservations, contact the Alford Memorial Radio Club, PO Box 1282, Stone Mountain GA 30086; (404)-476-2944.

SMALLEST US POST OFFICE
NOV 2–3

The Fort Myers Area Amateur Radio Club will operate a special-event station on November 2–3, 1985, from the US Post Office in Ochopee, Florida, the smallest Post Office in the US. Phone and CW activity will be on 20, 40, and 80 meters. For a picture postcard QSL, send your QSL and an SASE to the Fort Meyers Area Amateur Radio Club, PO Box 4814, North Fort Myers FL 33918.

WORKED ALL EL PASO
NOV 2–4

The annual Worked All El Paso Contest will be held from 1600 UTC November 2, 1985, to 0400 UTC November 4, 1985, on the 10-meter band. This contest is to assist operators outside of El Paso in contacting the 15 El Paso stations required for the WAE award. The WAE certificate has been issued since the mid-1930s. If you have 15 El Paso QSOs, any band or mode, submit your logs to the El Paso Amateur Radio Club, 2100 San Diego Avenue, El Paso TX 79930. *Don't* send money, SASEs, or stamps—there is absolutely no charge for this award.

NEWMARKET ONT
NOV 9

The York Region ARC will sponsor the ninth Newmarket Flea Market on Saturday, November 9, 1985, from 8:00 am to 2:00 pm, at the Huron Heights Secondary School, Newmarket, Ontario, Canada. Admission is $3.00, with children under 15 (accompanied by parents) free. Tables are $3.00 each and must be reserved in advance. Flea-market setup begins at 6:30 am. Talk-in on 146.52 (VE3YRA) and 147.825/147.225 (VE3YRC). For reservations or further information, contact Geoffrey Smith VE3KCE, 7 Johnson Road, Aurora, Ontario L4G 2A3, Canada; (416)-727-6672 evenings.

OWENSBORO KY
NOV 9

The Owensboro ARC will sponsor the ABC hamfest and computer show on Saturday, November 9, 1985, from 9:00 am to 4:00 pm, at the Chautaugua Center on Leitchfield Road, Owensboro KY. Dealer setup begins at 7:30 am. Admission is $3.00; tables are $3.00. VEC exams will be given. Talk-in on 147.81/.21. For further information, write the OARC, PO Box 231, Owensboro KY 42301; (502)-685-5292.

WEST MONROE LA
NOV 9

The Twin City Hams will hold a hamfest on Saturday, November 9, 1985, from 9:00 am to 4:00 pm, at the West Monroe Convention Center, North 7th Street, West Monroe LA. Swap tables are free. Exams will be given. Talk-in on 146.52 and 146.25/.85. For more information, contact Benson Scott AE5V, 107 Contempo Street, West Monroe LA 71291.

NORTH HAVEN CT
NOV 10

The Southcentral Connecticut Amateur Radio Association will hold its 6th annual indoor electronics flea market on November 10, 1985, at the North Haven Rec Center, Linsley Street, North Haven CT, from 9:00 am to 3:00 pm. 6-foot reserved tables are $10.00. Admission is $2.00. Talk-in on 146.01/.61. For more information or table reservations, send an SASE to Jerry Trichter WA1IUF, General Chairman, 136 Alden Avenue, New Haven CT 06515; (203)-389-4423 after 6:00 pm and (203)-934-2647 before 5:00 pm.

FT. WAYNE IN
NOV 10

The Allen County Amateur Radio Technical Society will sponsor the 13th annual Fort Wayne Hamfest on Sunday, November 10, 1985, from 8:00 am to 4:00 pm, at the Allen County Memorial Coliseum on Coliseum Boulevard (US 30), Fort Wayne IN. Admission is $3.50 in advance and $4.00 at the door. There will be 380 tables available—all indoors. Dealer setup begins at 5:00 am. Tables are $8.00 each. Premium tables are $20.00 each. Parking is $1.00. VE examinations will be given on Saturday, November 9, with advance registration only. For more information or reservations, contact AC-ARTS Hamfest, PO Box 10342, Fort Wayne IN 46851.

ROCKFORD IL
NOV 10

The Experimental Amateur Radio Society of Rockford IL will sponsor a hamfest on Sunday, November 10, 1985, at the Harlem Community Center, 900 Roosevelt Road, Machesney Park IL (just southeast of the Machesney Park Mall). Advance tickets are $3.00 (send SASE) or $4.00 at the door. Inside tables are $5.00 each. Talk-in on 146.01/.61. For further information, contact EARS, Inc., PO Box 4291, Rockford IL 61110.

VETERANS DAY
NOV 10–11

The Armored Forces Amateur Radio Net will operate special-event stations from 0000 UTC on November 10, 1985, to 2400 UTC on November 11, 1985, to commemorate Veterans Day. Member stations will operate on the following frequencies: Phone—3.870, 7.283, 14.325, and 21.375; CW—7.065. A certificate is available for contact with any member station. Send a #10 SASE to WB1DWR #90, 16 Berkely Circle, Newington CT 06111.

VETERANS WEEK
NOV 10–11

The Hamfesters Radio Club will operate special-event station K9WFN from 1500 UTC on November 10, 1985, to 0300 UTC on November 11, 1985, from the Robert K. Wade K9CDH Memorial Ham Shack at the Hines, Illinois, VA Hospital. Operation will be on 14.260, 7.60, 146.43 simplex, and 144.210 USB. For a certificate, send a QSL and a 9″ × 12″ SASE (if folds are OK, use a #10) to Hamfesters Radio Club, Inc., Chicago, c/o Robert K. Wade Memorial Ham Shack, Hines Veterans Administration Hospital, Hines IL 60141.

WESTWOOD NJ
NOV 16

The Stateline Radio Club of New York and New Jersey will sponsor the Stateline Hamfest on Saturday, November 16, 1985, beginning at 8:00 am, at the St. Andrews School, 120 Washington Avenue, Westwood NJ. Tickets are $3.00. Tailgating is $8.00 per space. Vendor space is $10.00 before October 31 and $13.00 afterwards. VEC testing will be available. Talk-in on 146.835 (K2LSA). For further information, contact Stateline Hamfest, Stateline Radio Club, PO Box 325, Montvale NJ 07656, or call Fred N2ATI at (201)-664-5320.

BILLERICA MA
NOV 23

The Honeywell 1200 Radio Club and the Waltham Amateur Radio Association will hold their annual amateur-radio and electronics auction on Saturday, November 23, 1985, beginning at 10:00 am, at the Honeywell Plant, 300 Concord Road, Billerica MA (Exit 27 off Route 3). Admission and parking are free. Talk-in on 147.72/.12 and 146.04/.64. For more information, contact Doug Purdy N1BUB, 3 Visco Road, Burlington MA 01803.

MILWAUKEE WI
NOV 24

The Milwaukee Repeater Club will sponsor the 6.91 Friendly Fest on Sunday, November 24, 1985, from 8:00 am to 4:00 pm, at Serb Hall, 51st and Oklahoma, Milwaukee WI. Tickets are $2.00 in advance and $3.00 at the door. 4-foot tables are $3.00 in advance and $4.00 at the door. For information or reservations, send an SASE to the Milwaukee Repeater Club, PO Box 2123, Milwaukee WI 53201, before November 11, 1985. Talk-in on 146.31/.91 and 146.52.

MASSILLON OH
NOV 24

The Massillon ARC will sponsor Auctionfest 85 on Sunday, November 24, 1985, from 8:00 am to 5:00 pm, at the Massillon K of C Hall (off Route 21), Massillon OH. Seller setup begins at 7:00 am. Admission is $2.50 advance and $3.50 at the door. Tables are $7.00 per 8-foot space. The auction starts at 11:00 am. Talk-in on 147.78/.18 (W8NP). For advance registration or information, send an SASE to MARC, PO Box 73, Massillon OH 44646.

WIA 75TH ANNIVERSARY

The Wireless Institute of Australia, the world's first radio society, will celebrate its 75th anniversary during 1985. The WIA 75 Award will be available during the period from March 1, 1985, to December 31, 1985. To qualify, amateurs (and SWLs) need to contact (log) 75 members of the WIA. A contact will be valid only if the WIA member's individual membership number is logged. No more than 30 WIA members may be logged in any one callsign area. Send a log extract of the 75 members contacted and $2.00 (Australian) to WIA 75 Award Manager, Wireless Institute of Australia, 412 Brunswick Street, Fitzroy 3065, Victoria, Australia.

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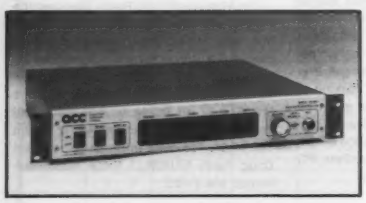
TO ORDER & INFO

Holiday Shopping Guide

In the August edition of The 73 Bulletin *(our publisher's newsletter to advertisers), we invited our advertisers to display their wares in this Holiday Shopping Guide. While we realize that not everyone was able to participate (due to time constraints), we are happy to offer these suggestions for your holiday shopping.*



ACC's model RC-850 repeater controller.

ADVANCED COMPUTER CONTROLS

ShackMaster

Hook your home station into ShackMaster and enjoy the benefits of being in front of your equipment even when you're spending time with your family. Scan the bands, check into nets, DX, and rag-chew—all through your hand-held radio linked back to your shack. With ShackMaster's six basic features—crossband linking, telephone access, BSR shack control, electronic mailbox, ShackPatch, and PersonalPatch—you have all the power of your home station anywhere. Leave messages for your family (or they can leave messages for you), turn equipment on and off, or make emergency telephone calls. Base price: $695.00.

RC-850

The RC-850 repeater controller offers everything on your club's wish list. And its little brother, the RC-85 controller, fits comfortably in any group's budget. RC-85 base price: $895.50, RC-850 starts at $1237.50. For more information, contact *Advanced Computer Controls, Inc., 10816 Northridge Square, Cupertino CA 95014; (408)-749-8330.*

The CP-1 Computer Patch from AEA.

AEA

Hot Rod™ Antenna

The Hot Rod antenna by AEA was designed to provide maximum transmitting and receiving performance for a 144-MHz (model HR-1) or 220-MHz (model HR-2) hand-held transceiver. Unlike the many 5/8-wave telescopic antennas on the market today, the 1/2-wave Hot Rod antenna is short and light and provides more gain in practical applications. The AEA Hot Rod antenna is priced at $19.95 Amateur Net and is available from leading amateur-radio dealers.

Isopole™ Antenna

The Isopole antenna has proven to be one of the most effective omnidirectional vertical-gain antennas available for VHF and UHF use. With the maximum radiation directed on the horizon (at zero degrees elevation), little power is wasted at undesired angles. The Isopole was designed to eliminate rf spillover, which can seriously degrade the rf interference performance of any antenna, especially in the presence of computers having inadequate shielding.

For VHF packet communications, the Isopole is an ideal digipeater antenna with a great direct range. Packet radio generally involves computers or video terminals that generate rf "hash" in the shack. The superior decoupling of the Isopole will help eliminate this troublesome problem. No RFI induced on the coaxial feedline will be "spilled over" onto the antenna and hence into the radio. Nor will your transmitted signal be coupled back into the shack down the feedline, thus preventing untold problems with computer equipment. The pleasing space-age appearance of the Isopole will decorate any environment. Priced at $49.95 Amateur Net, the Isopole is available from most leading amateur-radio dealers.

AEA Model CP-1 Computer Patch™

The CP-1 Computer Patch is one of the most popular computer interfaces in use today. Any computer may be used with the CP-1 with the appropriate software. AEA offers special programs for the CP-1 that will work with Commodore VIC-20, C-64, SX-64, and C-128, Apple II, II+, or IIe, IBM PC or PCjr, and Heath/Zenith H-89 computers.

Variable shift control on the CP-1 allows the user to tune nonstandard RTTY shifts for monitoring signals outside the ham bands. The variable shift control can also be used as a passband tuning control to help eliminate heavy QRM.

The Computer Patch is supplied with a 117-V-ac power supply. AEA-SOFT™ software packages include premade cabling (except RS-232) for connection between the CP-1 and the respective computer.

The Computer Patch CP-1 is available (at $199.95 suggested Amateur Net) from leading amateur-radio dealers across the US and Canada.

For more information concerning these AEA products, contact *Amateur Electronic Applications, PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.*

The Alinco ALM-203T 2m HT.

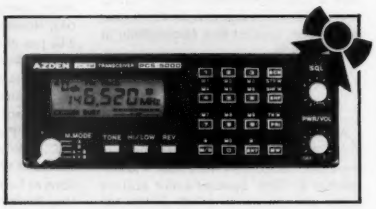
ALINCO

ALM-203T

Alinco has announced a new entry in the two-meter FM hand-held transceiver market. The new ALM-203T has many new and interesting features, some of which are unique. For example, the ability to transmit in the 144–148-MHz amateur band and receive between 140 and 160 MHz. There are ten memory channels, an LCD display, a small lamp to light the display at night, and a two-tone selectable subaudible CTCSS for private-line repeaters. Frequencies are entered by means of the keypad, and simplex/duplex operation with +/– offsets is available at the flick of a switch. Power output at 9.6 V dc is 3 Watts, and at 13.8 volts (standard) rf is 5 Watts. All standard accessories are available, and the unit comes complete with wall charger and NiCd battery pack at $345, list price. This unit soon will be followed by a two-meter mobile transceiver and a 440-MHz hand-held unit.

Dc Power Supplies

Alinco has introduced a quality power supply designed to compliment your station's appearance. These high-efficiency, high-output regulated supplies feature automatic current limiting and shutdown. Models range from 4.2 to 55 Amps. All supplies have outputs located on the front for easy access. There is a large meter for monitoring voltage and current. For more information, contact *Alinco Electronics, PO Box 70007, Reno NV 89570; (702)-359-1414.*



The Azden PCS-5000 from Amateur-Wholesale Electronics.

AZDEN PCS-5000 2M FM TRANSCEIVER

Amateur-Wholesale Electronics has announced the new Azden PCS-5000 2-meter microcomputer FM transceiver. The PCS-5000 has a frequency range of 140.000–152.995 MHz. This allows the unit to be used for CAP and all MARS frequencies. The radio is 2″ high by 5½″ wide by 7¼″ deep.

The microcomputer facilitates features including up to 11 nonstandard splits, 20 channels of memory in which offset and PL™ information can be stored, dual memory scan, scan lockout in memory mode, two ranges of programmable band scanning with selectable scan increments, busy scan and delay scan in both the memory and band-scan modes, discriminator scan centering, priority memory with alert tone, state-of-the-art lithium battery for memory backup, repeater reverse, acquisition tone, programmable PL generator, and direct frequency entry.

The backlighted liquid-crystal display shows operating functions as well as frequency and S/rf bar-graph meter.

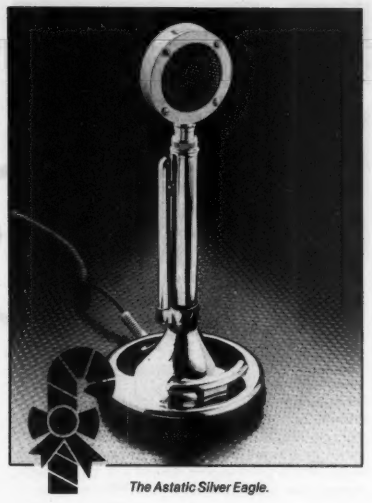
Other features of the PCS-5000 include high/low power (25 Watts and 5 Watts, fully adjustable), a receiver with superior sensitivity and dynamic range, true frequency modulation, a 16-key touchtone™ pad, a rugged multifunction dynamic microphone, a built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, and fuses.

The PCS-5000 is distributed by *Amateur-Wholesale Electronics, Inc., 8817 SW 129 Terrace, Miami FL 33176; (800)-327-3102.*

ASTATIC SILVER EAGLE

Amateurs report that for best results on SSB, the D-104 is still the leader. As a matter of fact, Astatic exports more microphones to Japan than any other country for the same reason US hams use the D-104 on Japanese radios. The crystal element works like a crystal filter, only passing on to the speech processor and sideband filters those frequencies that allow these circuits to do their job. This provides the "DX audio" sought by so many hams.

The most popular model, the Silver Eagle, is highly polished chrome and complements the appearance of any shack. The



The Astatic Silver Eagle.

Silver Eagle provides an emitter-follower impedance-matching amplifier so that it may interface with any transceiver.

For more information, contact *Astatic Corporation, PO Box 120, Conneaut OH 44030-0120; (216)-593-1111.* In Canada, contact *Canadian Astatic, Ltd., 1220 Eilesmere Rd., Unit 2, Scarborough, Ontario M1P 2X5; (416)-293-2222.*

B & W's model PT-2500A.

B & W HF LINEAR AMPLIFIER

The Barker & Williamson model PT-2500A is an HF linear amplifier designed for SSB, CW, RTTY, AM, or ATV operation on the amateur bands. The PT-2500A, using a pair of 3-500Z triodes, is a completely self-contained table-top amplifier capable of providing a full 1500 Watts of output. A pressurized plenum cooling system and a continuous-duty squirrel-cage blower ensure reliable and stable operation for extended periods of continuous use. The pi-network input circuit matches even the most finicky solid-state exciter. A pi-L tank circuit is incorporated for superior harmonic suppression. Designed originally by Viewstar, Inc., the PT-2500A will be manufactured by Barker & Williamson. The PT-2500A can be modified for frequencies outside the amateur bands for military or commercial use. The new PT-2500A will be available in early 1986.

For more information, contact *Barker & Williamson, 10 Canal Street, Bristol PA 19007; (215)-788-5581.*

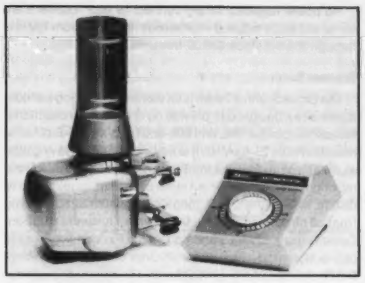
CMC COMMUNICATIONS

Docking Booster

A new idea to boost performance of your HT while mobile, the Docking Booster increases output power to 30 or 50 Watts and places the HT conveniently on the car door. A mike hang-up clip is provided. Most HTs need a front-end boost, too. The Docking Booster has a built-in GaAsFET preamplifier providing 16 dB of receive gain. Provisions are made to connect a roof-mount antenna and the car's 12-volt supply. Docking Boosters are available for most ICOM, Yaesu, and Kenwood radios only.

AR-200XL Antenna Rotor

Just dial in your desired heading and the rotor will turn and automatically stop when the heading is reached. The AR-200XL is a medium-duty rotor for your UHF and VHF arrays. Voltages are kept to 18 volts for safety, and only 3 wires are needed between the rotor and controller for simplicity and ease of installation.

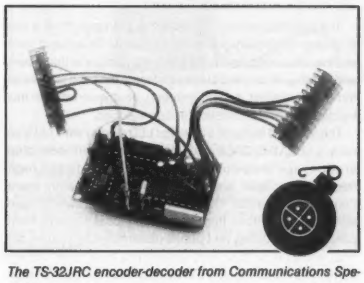


The AR-200XL antenna rotor from CMC.

Voice-Activated Squelch

Upgrade your new SSB transceiver with a voice-activated squelch. The VOS-1 is far superior on SSB to the all-mode squelch circuits supplied on most new rigs that simply operate from agc fluctuations. It is immune to noise, heterodynes, static crashes, and RTTY signals as it looks for certain components of the human voice before operating. Small enough to fit in most transceivers. Not a kit, completely wired and tested.

For further information, contact *CMC Communications, Inc., 5479 Jetport Industrial Blvd., Tampa FL 33614; (813)-885-3996.*



The TS-32JRC encoder-decoder from Communications Specialists.

COMMUNICATIONS SPECIALISTS PLUG-IN ENCODER-DECODER

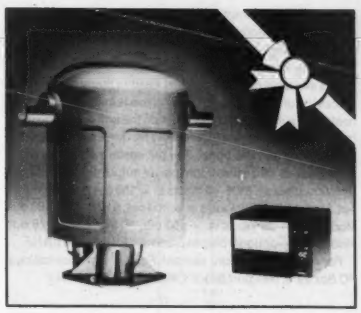
Communications Specialists has introduced another new direct plug-in encoder-decoder for three popular radios. The TS-32JRC is based on the proven TS-32 programmable encoder-decoder and plugs directly into the J.R.C. JHM-45S50, Sonar FM-2112/FM-2114, and Repco RSM. No modifications to the radios are necessary. The TS-32JRC allows individual selection of all 32 standard EIA CTCSS tones on any of the radios' 16 channels. The send and receive tones may be the same or different on each of the 16 channels. The TS-32JRC is available for immediate delivery from factory stock and sells for $62.95. For a catalog or more information, contact *Communications Specialists, Inc., 426 West Taft Avenue, Orange CA 92665-4296; (800)-854-0547, local (714)-998-3021.*

DYNETIC SYSTEMS DUAL-AXIS POSITIONING SYSTEM

Dynetic Systems Corporation has announced the availability of their new industrial-model DR10 dual-axis rotation system. Available for prompt delivery, the DR10 system provides both azimuth and elevation motion for camera lighting, microwave, or antenna-equipment loads (balanced) of 50 pounds or less.

The DR10 has undergone extensive testing in sub-zero conditions and is operating in other hostile environments with outstanding performance. Although aimed at light- to medium-duty systems, the rotator uses precision, industrial-grade gear motors manufactured by Dynetic Systems, which output 2000 inch-pounds of rated torque.

The DR10 features a dual-scale control meter, a self-contained ac power supply in the control unit, and a top-mount rotor which is serviceable without removing the equipment.



The DR10 dual-axis rotation system from Dynetic Systems.

For additional information, contact *Len Burgers, Marketing Manager, Dynetic Systems Corp., 19128 Industrial Blvd., Elk River MN 55330; (612)-441-4303.*

ETRON RF NOTES

RF Notes No. 2 is the second in a series of computer programs designed to aid in the design and development of rf systems and circuitry. The program series starts with basic topics and graduates into more sophisticated subject matter as the series progresses.

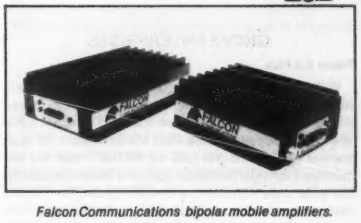
RF Notes No. 1 is a program which is a collection of basic RF Engineering notes from our engineering notebooks, reduced to program status. These notes can be quite useful in everyday radio-frequency engineering questions. The disk contains over 160K bytes of material in eight programs. The material is written in BasicA (or Cartridge Basic in the case of the PCjr) and is all menu-driven, in color, with error trapping. The computer environment is IBM PC-DOS or MS-DOS and 64K bytes of RAM minimum, color adapter required, and a graphics printer is suggested. (Other computers please inquire.) The price for RF Notes No. 1 is $57.00, plus $3.00 per program shipping and handling.

RF Notes No. 2 contains over 180K bytes of material and covers the following subjects:

- Attenuator pads: calculates circuit constants for 11 different pad configurations, to your specifications, all with schematic diagrams.
- Inductors: inductance of a single length of wire. Single-layer coils, both close-wound and space-wound. Includes automatic wire-size selection. Toroidal coil design. Includes automatic selection of wire size and toroidal form including manufacturer's part number. Includes mechanical and schematic diagrams.
- Capacitors: calculates self-resonant frequency, determines optimum values for bypass and decoupling applications. Equivalent circuit diagrams in schematic form are included.
- Impedance-matching networks: Using modern circuit theory, transformations with the L, pi, T, and series L networks are performed. There are 12 configurations, all with schematic-diagram data outputs.

RF Notes No. 2 is for the IBM PC, PC/XT, PCjr, and compatibles. The program is written in BasicA, in color (monochrome available), and requires 128K bytes of memory. The price for RF Notes No. 2 is $60.00 plus tax, plus $3.00 shipping and handling.

For more information, contact *Etron RF Enterprises, PO Box 4042, Diamond Bar CA 91765.*



Falcon Communications bipolar mobile amplifiers.

FALCON COMMUNICATIONS BIPOLAR MOBILE AMPLIFIERS

Falcon Communications offers a line of bipolar mobile amplifiers. Made in the USA, these amplifiers are all-mode (SSB,

CW, or FM) linear amplifiers mounted on large heat sinks for cool operation. Motorola rf power transistors are used for maximum reliability.

A carrier-operated relay is included and a remote keying jack is available on the rear panel. Built-in thermal protection places the unit in a straight-through mode in the event of overheating. It automatically resets when the unit cools down. An optional receive preamp is available for those users whose receivers need an extra boost. The two-meter versions of these amplifiers, all with a maximum power output of 150 Watts, are as follows: Model 5121—2 Watts in = 150 out, 1 Watt in = 90 out. Model 5122—10 Watts in = 150 out, 5 Watts in = 80 out. Model 5123—25 Watts in = 150 out, 10 Watts in = 75 out. Model 4109—optional plug-in preamp; 12 dB gain, 2 dB NF.

For more information, contact *Falcon Communications, PO Box 8979, Newport Beach CA 92658; (714)-760-3622.*

FOX-TANGO

Fox-Tango is known for the quality of their crystal filters, which are available for most of the popular ICOM, Yaesu, Kenwood, and other HF transceivers. For example, receiver selectivity may be improved through the use of 8-pole I-F filters as drop-in replacements for those in your transceiver. Included in the complete line of filters offered by Fox-Tango are 2.1-kHz (SSB) bandwidths, and 250-Hz or 500-Hz (CW) bandwidths. Complete instructions are included with each filter ordered, and discounts are available on multiple-quantity orders. For more information and a complete catalog, write *Fox-Tango, Box 15944S, W. Palm Beach FL 33416; (305)-683-9587.*

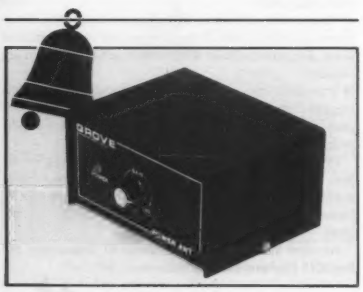
GLB ELECTRONICS

The GLB Model PK1-L is the first T[illegible] designed for portables and solar-powered stations. Specia[illegible] features include:

- Low current drain—25 mA, 12 V dc
- Miniature size—4.6" x 5.8" x 1"
- Weighs 12 ounces including cabinet
- On-board lithium-battery RAM backup
- On-board "watchdog" for reliability
- Retains all features of the Model PK-1
- Standard DB25 connections
- 8K RAM—16K ROM
- Squelched audio not required

The Model PK1-L comes completely wired and tested in an all-metal shielded cabinet. List price: $239.95, Amateur Net: $209.95.

For more information, contact *GLB Electronics, 151 Commerce Parkway, Buffalo NY 14224; (716)-675-6740.*



The Power Ant Plus from Grove Enterprises.

GROVE ENTERPRISES

Power Ant Plus

With total-spectrum 100-kHz–1300-MHz coverage and up to 30 dB gain, this new Grove low-noise preamplifier can make a difference in longwave, shortwave, scanner, TV, and FM signal strength. Equipped with standard Motorola jacks for most scanner applications. We took our ANT-4B Power Ant and modified it for wider bandwidth and lower intermodulation so that it can cope with strong and weak signals alike. Use the front-panel gain control to boost weak, distant signals or to attenuate overload from strong local powerhouses. Price: $49.00 plus $2 UPS or $5 US mail.

Miniluner III

This shortwave/longwave performance booster can eliminate images, intermod, and phantom signals on your shortwave receiver.

No power required; simply connect to your receiver's antenna and enjoy reduced interference reception from 100 kHz through 30 MHz. Price: $39.00, free UPS, $5.00 US mail.

Scanner Beam

The Grove Scanner Beam is an eleven-element log-periodic dipole array, designed to provide no-compromise directional reception from 108–512 and 806–960 MHz, and bi-directional reception from 25–54 MHz. It is made of durable heavy-gauge aluminum. With 15 dB of front-to-back ratio and 30 dB of side rejection, the Scanner Beam ensures maximum response to distant, weak signals, yet strong local signals may be received from all directions without the need for antenna rotation. Comes equipped with standard TV-type F connector for easy connection to low-loss 50- or 75-Ohm coaxial cable. Price: $40.00 plus $3.00 UPS, $6.00 US mail. For information or catalog, write *Grove Enterprises, PO Box 98, Brasstown NC 28902; (704)-837-9200; order desk, (800)-438-8155.*

Heath's SW-7800 general-coverage receiver.

HEATH

SW-7800 General-Coverage Receiver

The SW-7800 receiver covers 150 kHz through 30 MHz continuously in 30 overlapping 1-MHz bands. Broadband front-end circuits eliminate the need to tune circuits within a band and wideband front-end stages eliminate the need for the customary rf amplifier. An upconverting, double-conversion mixing design provides excellent image rejection.

The SW-7800 features a five-digit LED display with 1-kHz accuracy, LSB, USB, CW, and AM (wide and narrow) modes of operation, agc time-constant switch, synthesized high-frequency oscillator, and a muting provision to permit operation with a transmitter. Other features include a switch to protect against overload from very strong local stations, front-panel jack for taping receptions (unaffected by volume setting), and a telescoping whip antenna for local reception and portable operation. Only a VTVM is required for receiver alignment.

HD-3006 Crossfire Tuning Indicator

The new HD-3006 is a visual tuning indicator for RTTY communication. Sixteen LEDs make up the display: Eight vertical LEDs identify mark signal strength while eight horizontal LEDs do the same for space signal strength. Tuning the indicator for maximum vertical and horizontal display will provide a strong signal for computers or RTTY printers. Each LED bar requires approximately 14-dB no-signal-to-signal voltage ratio for full operation. Minimum input signal is 0.3 V ac rms or 0.5 V dc. Maximum signal is 15 V ac rms or 15 V dc.

The HD-3006 Crossfire Tuning Indicator has a wide voltage range and is compatible with almost any interface/terminal unit that has oscilloscope outputs for tuning. The ac/dc cube-type power supply is included in the kit.

Terminal Node Controller

The HD-4040 terminal node controller (TNC) has been added to the amateur-radio product lineup at Heath Company.

The HD-4040 is a version of the popular Tucson Amateur Packet Radio (TAPR) which allows communication using terminal or computer control of any amateur-radio system. Packet radio ensures error-free communication and greatly increases communication speed. The HD-4040 has a built-in 1200-baud modem. Baud rates of up to 9600 are possible with an external modem. Both AX.25 and VADCG protocols are used.

Three modes of operation are provided: a conversation mode which allows conversation with another operator, a command mode which allows configuration of the TNC and use of a variety of operating commands, and a transparent mode which is used in transferring files from one computer to another. A 6809 processor and a 32K ROM and 8K RAM are featured. Both ROM and RAM can be expanded by adding up to 16K.

A built-in automatic beacon can be set to transmit a message at designated intervals determined by the operator. Any station can act as a digital repeater and up to eight such "linking" stations are allowed, which greatly expand the operator's range.

For more information on these products, write to *Heath Company, Dept. 150-565, Benton Harbor MI 49022.* In Canada, write *Heath Company, 1020 Islington Avenue, Dept. 3100, Toronto, Ontario M8Z 5Z3.*

The IC-3200A dual bander.

ICOM

IC-3200A Dual Bander

ICOM has announced the IC-3200A 25-Watt compact full-featured dual bander. With only 14 front-panel controls, the IC-3200A offers these features:

- Frequency coverage: 2 meter (140.000–150.000 MHz), 70 cm (440.000–450.000 MHz)
- 5-kHz fully programmable offsets for MARS and CAP repeater operation
- 5½" W x 2" H x 8½" D
- 25 Watts output on both bands
- Memory lockout
- Scanning: memory, band, programmable, and priority
- Ten tunable memories with lithium battery to maintain memories when disconnected from the power source
- LCD display
- Tone encoder (all PL and subaudible tones built-in)
- One antenna connector (duplexer is already installed)
- Variable tuning increments: 5 and 15 kHz (2 meters), 5 and 25 kHz (70 cm)

The IC-3200A also comes standard with an IC-HM14 touchtone™ mike with up/down scan, dc power cord, and a mobile mounting bracket. Suggested retail price is $549.00.

IC-1271A 1.2-GHz Transceiver

ICOM has announced the IC-1271A full-featured base station transceiver. With coverage from 1240 to 1300 MHz, the IC-1271A features 10 Watts of rf output power, 32 memories, scanning, and multimode operation including ATV (amateur TV).

Additional features include:

- Front-end GaAsFETs
- CW/FM/upper and lower SSB
- Scanning—memory, program, or mode scan
- 12 V dc or 117/240 V ac (optional)

Options include the TV-1200 ATV interface unit, IC-EX310 voice synthesizer, UT-15S CTCSS encoder/decoder, and IC-PS25 13.8-V-dc internal power supply. Suggested retail price is $999.00. For more information, contact *ICOM America, Inc., 2380 116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

INTERNATIONAL RADIO

International Radio offers 8-pole crystal filters for ICOM 730, 735, 740, 745, 751, R70, R71, and R7000:

- Drop-in 2.1-kHz SSB, 9.0115-MHz center frequency (CF), replaces FL-30—$49.00
- Drop-in 2.4-kHz SSB, 455.00 CF, replaces FL-44 exactly—$80.00
- Wire-in 2.1- kHz SSB, 455.00 CF, replaces FL-44—$99.00
- Drop-in 400-Hz CW, 9.0106 CF, replaces FL-32—$49.00
- Matched set SSB 2.1 kHz—$139.00
- Matched set CW 400 Hz—$139.00

For more information, contact *International Radio, Inc., 1532 SE Village Green Dr., Suite L, Port St. Lucie FL 33452; (305)-335-5545.*

Kantronics Packet Communicator.

KANTRONICS

Universal Terminal Unit

Kantronics has announced a new concept in computer-to-transceiver interfacing. The Kantronics Universal Terminal Unit (UTU) gives any computer with an RS-232 port and a terminal program the ability to interface with any transceiver. The need for additional programs has been eliminated with the inclusion of a microcomputer in UTU. The internal programming of UTU allows reception and transmission of Morse code, radioteletype, ASCII, and AMTOR.

To access the internal program a terminal program is used. The terminal program is usually very similar to the program used for telephone modem operation. The manual shipped with the Kantronics UTU includes terminal program examples for IBM, Kaypro, Radio Shack TRS-80 Models III and IV, and many other popular computers.

The UTU gives the operator the freedom to program additional features or to use the system in its standard format.

The Universal Terminal Unit is housed in a precision extruded aluminum alloy case. The ten-segment LED bar graph is used for tuning, and individual LEDs show lock and valid status during AMTOR operation. UTU requires 12 volts dc, 200 mA minimum, and the user must provide the power supply.

The internal menu driven UTU program allows transmission and reception of CW at 6–99 wpm, radioteletype at 60, 67, 75, 100, and 132 wpm, ASCII at 110, 150, 200, and 300 baud, and AMTOR modes A, B, and L. These capabilities give the operator the opportunity to communicate in four different coded amateur formats. Suggested retail price: $199.95.

Packet Communicator

To better utilize the new packet technology, Kantronics has designed a new hardware format for processing the packet protocol. By using an internal microprocessor to handle the protocol and integrated circuits for signal processing, the Kantronics Packet Communicator becomes the most compact and inexpensive finished packet unit available today.

Data is transmitted between the Kantronics Packet Communicator and the computer using a serial RS-232 or TTL port. Baud rates of 300, 1200, and 9600 can be used. Any terminal or communications software program, like those used for telephone modem operation, can be used to set up the computer to communicate with the Packet Communicator. Special Packet Terminal (Pac-Term™) programs for many popular personal computers will be available soon from Kantronics.

System compatibility, the ability to exchange data with existing packet terminal node controllers, has been achieved with the Kantronics Packet Communicator by using the popular Tucson Amateur Packet Radio group software program. Almost all of the commands and operation procedures used by the TAPR group are used with the Kantronics Communicator. Both the ARRL standard AX.25 and Vancouver protocols are incorporated in the unit. The Kantronics Packet Communicator supports baud rates of 300, 400, 600, and 1200, but the unit does not support full-duplex operation.

An added feature of the Kantronics Packet Communicator is the ability to select either Bell 103 or 202 tones for 300-baud operation. This will allow the operator to switch to the lower tone set, improving performance at slower speeds on the HF bands. This feature makes the Kantronics Packet Communicator an excellent choice for gateway use on the HF bands.

The Kantronics Packet Communicator will also function as an intelligent 1200-baud radio modem. This feature gives the operator the ability to transmit and receive data at high speeds without using any special protocol.

The unit is housed in an extruded aluminum case measuring 1.9″ H×5.9″ W×8″ D. An external power supply and cables for connection to the transceiver and computer are included. The user must provide the RS-232 and microphone connectors for his station. The Kantronics Packet Communicator is not available in kit form. Suggested retail price: $219.00. For more information, contact *Kantronics, 1202 E. 23rd St., Lawrence KS 66046.*

The TH-21AT from Kenwood.

KENWOOD

TH Series HTs

- High/low power switch (1 Watt high, 150 mW low)
- TH-21A and TH-21AT have expanded frequency coverage for most MARS and CAP frequencies (141.000–150.995 MHz)
- TH-31A/TH-31AT: 220.000–224.995 MHz in 5-kHz steps
- TH-41A/TH-41AT: 440.000–449.995 MHz in 5-kHz steps
- Repeater offset switch
- Quick change, locking battery case
- Comes complete with rubber flex antenna, 180-mAh battery, wall charger, and wrist strap

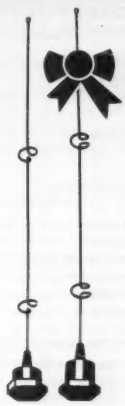
TS-430S Compact HF Transceiver

- 150-kHz–30-MHz general-coverage receiver
- I-f shift
- Tunable notch filter
- LSB, USB, AM, CW, FM (optional)
- Programmable, multi-function scanning
- 8 memories, with memory channel 8 for split-frequency operation
- Built-in speech processor

TS-940S HF Transceiver

- 100% duty cycle transmitter (14,150 kHz, CW mode, 110 W, 60 mins.)
- Built-in FM
- 40 memory channels
- General-coverage receiver, 150 kHz–30 MHz
- Direct keyboard entry of frequency selection
- Exclusive multi-function LCD panel that graphically illustrates CW VBT, SSB slope tune, frequency, time, and antenna-tuner status (when AT-940 installed)
- Automatic antenna tuner built in (covers 160–10 meters)
- Semi or full break-in (QSK) CW
- Pan display capability (when SM-220 equipped with BS-8)
- SSB slope tuning, CW VBT, notch filter for interference reduction
- Voice synthesizer option (VS-1)
- Dynamic range exceeding 102 dB

There is a full line of optional accessories available for these products. For more information, contact *Trio-Kenwood Communications, PO Box 7065, Compton CA 90224; (213)-639-9000.*



The 1290 antenna series from Larsen.

LARSEN ELECTRONICS

Self-Resonant Antenna for Portables

The new Larsen KD14-440-HW (440–450 MHz) is a half-wave design that is resonant despite the poor ground plane provided by the portable. It is 12″ long and fits any radio with BNC output. Suggested retail price is $32.50.

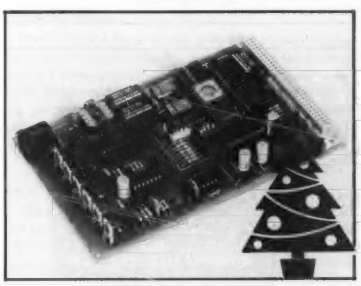
The 2/70 Antenna Series

These antennas are for operation on VHF and UHF frequencies. One antenna covers both frequencies without tuning. By combining ⅝- and ½-wave elements, one antenna covers 2-meter (144–148 MHz) and 70-cm (440–450 MHz) amateur frequencies. They operate with or without a ground plane. Units available to fit Larsen NLA, NMO, and PO mounting hardware. Suggested retail price is $45.22 each.

The 1290 Series for 1.2-GHz Use

The design of this series combines 2 half-wave elements fed by a quarter-wave element with integral phasing. They deliver a full 5 dB gain when compared with a quarter-wave antenna mounted in the same location. Low-loss mounting kit is available for both Larsen NMO- and NLA-style mounting. Suggested retail price is $26.12.

For more information, contact *Larsen Electronics, 11611 NE 50th Ave., PO Box 1799, Vancouver WA 98668; (206)-573-2722.*



The HPC201B microcomputer controller from Maggiore.

MAGGIORE

HPC201B Microcomputer Controller with Autopatch

The HPC201B is a computerized repeater control system with all these features:

- User programmable key code and autopatch codes
- Intelligent autopatch
- Programmable courtesy tone
- User-controlled toll restrict
- Up to 7 individually controlled 500-mA outputs
- Valid tone acknowledgement with LED
- Smart identifier, user-programmable
- Input status indicators
- Input and output amplifiers
- Mating connector

- Size: 3¼" W × 6½" L × ⅞" H
- Multi-digit programmable command and autopatch codes
- Reverse autopatch and repeater telephone control
- Burglar-alarm input
- Tone muting
- Tone masking
- Three-speed rotary dialer
- 911 capability
- Redialer
- Up to 60 different functions
- 16-digit decoder
- Auxiliary or link input
- LED indicator outputs
- Uses single 12-volt power supply
- Easy repeater connections
- Sockets used on all ICs
- Source listing available

Hi Pro "E" Expandable Repeater System

The Hi Pro "E" is an expandable repeater system with the following features: a basic repeater which would include a complete receiver, transmitter, COR, front-panel controls, indicators, local speaker, and mike jack. The Hi Pro "E" is housed in an enclosed, 19" rack-mountable cabinet.

This system can be expanded at the time of purchase, or one can obtain after-purchase add-ons when required, such as a higher-power, 110/220-volt-ac power supply, identifier, autopatch, or computer controller. In addition to these add-ons an additional receiver and transmitter can be mounted internally for such uses as control-link, remote-base, or dual-band operation, etc. An extension panel is available for local monitoring of the repeater with a control cable that plugs directly into the rear of the repeater. This panel contains all necessary metering, status lights, and indicators. All add-ons to expand the system will be available from the company and are complete including instructions for proper installation.

For more information, contact *Maggiore Electronic Laboratory, 590 Snyder Avenue, West Chester PA 19380; (215)-436-6051.*

GLEN MARTIN ENGINEERING

Glen Martin Engineering, Inc., will soon be releasing a new line of steel towers that are truly self-supporting in 100-mph winds and handle antenna loads ranging to 30 square feet at heights to 300 feet.

The tower has an equilateral triangular design with face width ranging from 16" to 6'. There are tapered as well as straight sections. Material is hot-dipped galvanized steel and all bolted constuction. For more information, contact *Glen Martin Engineering, Inc., PO Box 253, Boonville MO 65233; (816)-882-2734.*

The MFJ Mobile Antenna Matcher.

MFJ ENTERPRISES

MFJ-949C Deluxe Versa Tuner II

The new MFJ-949C Deluxe Versa Tuner is a completely new design with improvements over the 949B. It has a cross-needle meter that reads forward power, reflected power, and swr simultaneously in either 300 or 30 Watts, with no swr sensitivity adjustment needed.

Providing maximum power transfer from your transmitter to nearly any antenna, the unit can handle up to 300 Watts rf output from the transmitter from 160 through 10 meters. A three-inch-diameter air-wound inductor gives plenty of matching range and less loss for more Watts out. The 6-position antenna switch allows selection of: two coax lines (direct or through the tuner), random wire or balanced line, and dummy load. For balanced lines, a 1:4 balun is built into this unit.

The MFJ-949C also includes a 50-Ohm dummy load, 1000-volt capacitors, and SO-239 connectors and binding posts for balanced line, random wire, and ground.

Measuring 10 × 3 × 7 inches, the unit can be used with any transmitter and antenna, home or mobile. It retails for $149.95.

MFJ-815 Cross-Needle Swr/Wattmeter

A cross-needle swr/wattmeter enabling ham operators to read swr, forward, and reflected power at a single glance is now available. No swr setting is needed at any range.

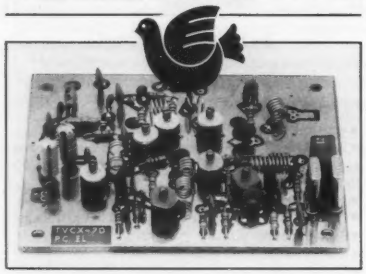
The average forward and reflected power can be read in three ranges: 20/200/2000 Watts forward and 5/50/500 Watts reflected. Swr can be read from 1:1 to 1:5 on a two-color scale. The unit works from 1.8 to 30 MHz, and accuracy is ± 10% full scale. Ranges are push-button selected. It sells for $59.95.

MFJ-910 Mobile Antenna Matcher

The MFJ-910 is a Mobile Antenna Matcher which lowers swr by capacitive matching a mobile antenna to 50 Ohms; more power results out of the transmitter and into the antenna, especially if a solid-state rig is being used. The MFJ-910 matches mobile antennas for 10 through 80 meters. It measures only 2½" × 2½" and can be mounted inconspicuously with the mounting holes provided. Installation is simply the connecting of the antenna to the SO-239 connector labeled "out" and the transmitter to the SO-239 connector labeled "in."

The Mobile Antenna Matcher retails for $19.95.

All MFJ products come with an unconditional 1-year warranty, and items bought directly from MFJ have an additional 30-day guarantee. If not completely happy with your product during that time, it may be returned for a full refund minus the shipping and handling charge. For further information, call *(800)-647-1800 or write to MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762.*



P. C. Electronics' crystal-controlled version of its downconverter.

P. C. ELECTRONICS' DOWNCONVERTERS

Dual-gate GaAsFETs in the preamp and mixer stages make the P. C. Electronics TVC-4Ga GaAsFET 70-cm ATV downconverter a very sensitive unit which will dig out the weakest video from the snow. The high-Z, double-tuned bandpass filter as well as the GaAsFETs' high resistance to intermod really reject strong UHF TV broadcast and other out-of-band signals. The active mixer has the same dynamic range as a doubly-balanced mixer but with gain and low noise figure. A varicap-tuned vco covers the whole 420–450-MHz band with just enough overlap for the downconverter to output to your TV on any open channel from 2 to 4.

The TVC-4Ga can be powered by any external 12-V-dc power supply or by the 120-V-ac/12-V power supply that comes with it. Antenna input is a BNC and the TV output is a type F. The cabinet is 4" × 2.5" × 7". The unit is $109.00 delivered.

Those who want to package their own downconverter for the shack or antenna mount can get the wired and tested board (TVC-2Ga) by itself for $69.00, and there is the crystal-controlled version (TVCX-70) designed for unattended operations such as repeaters, links, and public-service events. It comes as a wired and tested circuit board set up to your specified input frequency and output TV channel. Requiring 12 V dc, it is $89.00 delivered.

For further information, call or write *P. C. Electronics, 2522 Paxson Lane, Arcadia CA 91006; (818)-447-4565.*

Palomar's P-410X preamplifier.

PALOMAR ENGINEERS

Transceiver Preamplifier

A new addition to the line of preamplifiers is the model P-410X, featuring improved selectivity and faster send/receive switching. It connects between transceiver and antenna, providing more than 20 dB extra gain and a low noise figure. Gain is continuously variable. An rf-sensing circuit automatically bypasses the preamplifier during transmit. The fail-safe switching circuit handles transceivers to 350 Watts PEP. Connectors are SO-239.

Universal Audio Filter

The new model FL-4 is for SSB/CW/RTTY/AM and features switched capacitor filters. A 10-pole low pass and an 8-pole high pass can be moved anywhere in the 200–3500-Hz voice range to form a sharp bandpass filter at any frequency and of any bandwidth. A notch filter eliminates heterodynes. It connects between receiver and speaker. The on-off switch bypasses the filter when not in use. For 15 V dc. An optional 115-V-ac adapter is available.

New High-Power Balun

The "Big Beam" balun has been optimized for the 7–30-MHz range. This new model BA-2000 has improved balance and swr across the range. The power rating is 2000 Watts output power through the balun with a good safety factor. It has been tested and works well at 5000 Watts. The BA-2000 is recommended for beams on 40, 20, 15, and 10 meters when high power is used. 1:1 ratio.

For further information on any of these items, contact *Palomar Engineers, Box 455, Escondido CA 92025; (619)-747-3343.*

PROTOPIC

Dave Smart has formed Protopic (prototype printed circuits) which specializes in fabbing PC boards for the prototyper, entrepreneur, or hobbyist. The company can turn out the first and second of a single- or double-sided PTH board for roughly half the cost charged by most production shops. The company also designs boards, prepares artwork, and stuffs boards to customer needs. For more information, contact *Protopic, PO Box 9853, Berkeley CA 94709; (415)-843-1326.*

NEW CALLBOOKS

Announcing the biggest change in its 65-year history, Radio Amateur Callbook, Inc., presents three new publications for 1986. The *North American Callbook*, the *International Callbook*, and the *Callbook Supplement* will provide current QSL information for over 880,000 radio amateurs throughout the world.

To be published on December 1, 1985, the new 1986 *North American Callbook* lists the licensed amateurs in all countries in North America plus those in Hawaii and US possessions. Not just a reprint of government licensing records, this listing information is carefully screened and corrected by our own editorial staff to ensure the utmost accuracy. Also featured are the *Callbook* extras: international postal information, worldwide QSL bureaus, and a census of radio amateurs around the world.

Also to be published on December 1st, the *International Callbook* lists the calls, names, and address information for licensed amateurs in all countries outside North America. Fully updated by the editorial staff using information from official sources throughout the world, coverage includes Europe, Asia, Africa, South America, and the Pacific area (exclusive of Hawaii and the US possessions).

The 1986 *Callbook Supplement* is a whole new concept in updates. To be published June 1st, the new supple-

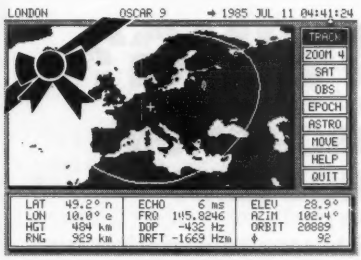
ment will list the combined activity in both callbooks for the preceding 6 months. One supplement, available from your local dealer or the publisher, will bring you thousands of new licenses, address changes, and "then and now" call changes from countries around the world.

For additional information or literature, contact *Radio Amateur Callbook, Inc., 925 Sherwood Drive, Box 247, Lake Bluff IL 60044.*

Regency's MX7000 scanner.

REGENCY ELECTRONICS SCANNER REACHES 1.3 GHZ

In addition to monitoring all frequencies between 25 MHz and 550 MHz, the Regency MX7000 is one of the few scanners that can cover frequencies as high as 1.3 GHz. The scanner can monitor up to 20 channels or search through an entire band for an active new frequency. Other features include a 24-hour digital clock, priority channel, dual scan speeds, and scan or search delay. The MX7000 is designed for home or mobile use; a suggested retail price of $699.95 includes telescoping whip antenna, ac power supply, dc power cord, and a mobile mounting bracket. Complete details are available from suppliers or *Regency Electronics, Inc., 7707 Records Street, Indianapolis IN 46226.*



Silicon Solutions' GrafTrak II.

SILICON SOLUTIONS

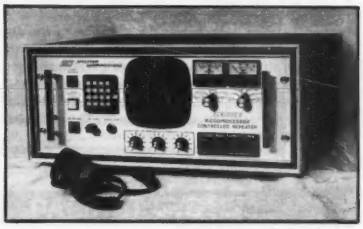
GrafTrak II

GrafTrak II provides real-time graphic display of a flat projection map which moves under the selected satellite/sun/moon/star coverage circle and updates once per second. Spherical projection views as well as graphic screen dumps to your Epson/Oki printer can also be produced. Requires an IBM PC, PC/XT, or true compatible, an IBM Color/Graphics Monitor Adapter, 8087 math coprocessor, minimum 256K RAM with 512K recommended, DOS 2.0 or later, and either two 360K floppy drives or one 360K floppy and one hard drive.

Silicon Ephemeris

Silicon Ephemeris provides tabular data output to the screen, printer, or disk file for the following operating modes: 1 observer to 16 satellites, 16 observers to 1 satellite, schedule for 1 observer to 1 satellite, window between 2 observers and 1 satellite, rise and set times for 1 satellite, time-ordered rise and set times for 16 satellites, almanac for sun and moon, 16 observers to sun/moon, schedule for 1 observer to moon, window between 2 observers and moon, schedule for one observer to sun. Requires an IBM PC, PC/XT, PC/AT, PC/jr, or true compatible, either an IBM Monochrome or Color/Graphics Monitor Adapter, an optional 8087 math coprocessor, 256K RAM, DOS 2.0 or later, and 360K floppy drive.

Each package includes SED, an editor program to construct and modify satellite/observer database files. These products can be run from a hard disk and are not copy protected. GrarTrak II and Silicon Ephemeris are priced at $119.95 each or $199.95 for both. For more information, contact *Silicon Solutions, Inc., PO Box 742546, Houston TX 77274-2546; (713)-661-8727.*



Spectrum Communications' SCR2000X microprocessor-controlled repeater.

SPECTRUM

Repeater/Base VHF and UHF Power Amplifiers

The Spectrum SCA 100 150-W VHF and 100-W UHF high-power amplifiers can be used with any 10–40-Watt transmitter, repeater, or base station. They feature: automatic high vswr shutdown/bypass mode with 4X automatic reset circuit, and auto amp bypass if the power supply should fail or if the amp should overheat. The 100-Watt UHF version is available for 420–450 MHz; 150-Watt VHF for 144–148 MHz. 19″ rack mount. A heavy-duty companion power supply, the SCP30, is also available. Its ratings are 13.8 V dc out at 25 Amps, 100% continuous duty.

SCR2000X Microprocessor-Controlled Repeater

The repeater includes the following features:

- Full autopatch and touchtone™ repeater remote-control capability. Patch agc for constant levels.
- Phone line and over-the-air command modes
- Up to 13 autodial phone numbers
- Touchtone-to-dial-pulse converter
- Full 16-digit decoding with crystal-controlled decoder IC allows the use of A, B, C, and D characters in control codes. This expands the number of possible codes and increases security.
- Touchtone control of all important repeater functions: timeout, hang time, patch timeout, transmitter inhibit/reset, patch and reverse patch inhibit/reset, PL™ on/off (with optional PL board), etc.
- Up to 6 auxiliary functions—expandable
- Built-in muting circuit prevents retransmission of control tones
- Automatic CW ID and remote ID command
- Distinctive courtesy tone
- "Kerchunk Killer" circuit discourages annoying keyups
- Timeout warning tone
- Built-in battery backup saves microprocessor memory in case of power failure
- The following transmitter options are available: 2 M, 30 or 75 Watts; 220 MHz, 30 or 65 Watts; 440 MHz, 40 Watts. High-power rack-mount repeater power amps and power supplies are available to 150 Watts.
- A high-performance receiver is included, with high sensitivity, selectivity, and wide dynamic range. An 8-pole front-end filter is standard as well as a 12-pole i-f filter. "Super sharp" filter options are also available.

SCR77D Desktop/Portable Repeater

The SCR77D is a new desktop/portable repeater. Its compact, low-power design makes it ideal for local use (within a 0–20-mile radius, depending on antenna and terrain). It may be used at a fixed location, or portable/mobile. Autopatch and PL are available built-in. Ac power supply is built in, plus jacks for 12-V-dc power. Full-duplex base-station applications, such as computer data links or export "rural telephone," are also ideal for the SCR77D. Standard models include a 10-Watt UHF unit with built-in duplexer and a 15-Watt VHF unit with external duplexer. For more information, contact *Spectrum Communications, 1055 W. Germantown Pk., Norristown PA 19401-9616; (215)-631-1710.*

H. STEWART DESIGNS

DX Quickshift Antenna Mount

Mount on side or roof of motor vehicles or trailers. It takes antennas with ⅜″ mounting studs. Raise or lower antenna with a 90-degree turn of one hand; it locks in position but it is easy to unlock and turn. All coax connections are sealed behind O-rings, weather and corrosion proof. Cost is $59.95, shipping paid, with all attachment hardware.

DX Hidden-Asset Loop Antenna

For those who can't have a visible antenna, this full-wave loop, omnidirectional, fits in a cylindrical space (vertically polarized) about 0.1λ high by about 0.125λ in diameter. It is broadbanded, swr 1.2:1 or less at resonance, and power handling up to legal limits. It feeds directly with 50-Ohm coaxial cable. Complete plans are $12.50; plans with complete pre-cut kits, shipping paid, are: 2 meter—$39.95, 6 meter—$47.95, 10 meter—$54.95, and 15 meter—$67.95. Prices on request for other frequencies.

II DX Two-Element Directional Antenna

These made-to-order full-wave loops mount in a very small space. Gain 5 to 7 dB over a single element, excellent rejection, bandwidth at least 3 percent of resonant frequency. When vertically polarized, they will rotate in a cylindrical space 0.25λ high by 0.16λ in diameter. Direct feed with 50-Ohm coax, tunable for radiation pattern/gain, and for frequency. Prices for kits and assembly instructions on request; specify frequency(ies).

For further information on any of these items, write to *H. Stewart Designs, PO Box 643, Oregon City OR 97045.*

Sultronics' Super Sloper.

SULTRONICS

The Super Sloper

The Sultronics Super Sloper covers 40, 80, and 160 meters and is only 60 feet long. It is as good a DX antenna as it is a low-angle radiator. It requires a mounting height of 25–35 feet and requires a good ground for the mounting bracket at the top. This is a very popular antenna since the low bands have very good propagation right now, and is $39.95 ppd.

Daiwa 2-Meter Amplifier

The Daiwa LA2035 2-meter amplifier (.5/3 in, 30 out) has the same quality as their cross-needle meters. Operates FM/SSB/CW on 13.8 V dc. Comes supplied with mounting bracket, BNC connector installed on the front; the meter measures relative power output. Comes with power cord and built-in fuse; $65.00 ppd.

TE SYSTEMS

TE Systems has announced the availability of its new high-power UHF linear rf amplifier model 4410G which incorporates a high-quality GaAsFET preamplifier within the rf PA unit. The unit operates over the 420–450-MHz band and is particularly useful for OSCAR work. The rf power amp delivers 100 Watts minimum output power for 10 Watts drive and is compatible with all transmission modes (FM, CW, SSB, ATV). T/R switching sensitivity is rated down to ½ Watt. The front panel allows the operator to select the various operating options: PA on but no preamp, preamp on with PA off, etc. A 30-page manual accompanies the unit, describing it in detail. For more

TE Systems' 4410G power amp.

information, contact *TE Systems, PO Box 25845, Los Angeles CA; (213)-478-0591.*

UNADILLA/REYCO

W2DU HF and VHF High-Power Maxi-Baluns

The W2DU Maxi-Baluns (maximum power) contain no ferrite cores or material in the high-power portion of the circuit: no core to saturate at high antenna swr levels and therefore no harmonic generation. The internal feedline passes through a series of ferrite beads which prevent current flow on the outer braid. This prevents accidental radiation of rf interference and results in balanced currents on the two halves of the dipole. Since no coupling transformer is involved, error-free antenna impedance measurements can be made at the coaxial connector. The W2DU-HF and W2DU-VHF cost $19.95 each.

W2AU/W2VS 40- and 80-Meter Antenna Kit

Kit includes:

- 1 pair model KW-40 traps
- 1 W2AU 1:1 balun
- 1 pair W2AU end-sulators
- 125' quality #14-7 strand copper wire

When installed and adjusted per instructions, low swr results on 40 and 80 meters. Through a "multiple half-wavelength effect" (see chapter 21 *ARRL Handbook*) you also get resonance on 10, 15, and 20 meters. (Swr on 10, 15, and 20 will be higher, 2:1 to 4:1 typically, and a transmatch may be necessary to operate on these bands.) The kit costs $65.00.

W2VS Reyco Antenna Traps

- User tunable
- Special frequencies available
- Precision frequency paired
- Have 500-pound-plus pull-apart strength
- Weatherized

At resonance, the trap is an "open circuit" and cuts the dipole to resonant length for that frequency. Addition of traps to a dipole provides low swr on 2 to 6 bands, depending on how many are added. If a KW-40 pair is added there will be perfect dipole performance on 40 and 80 meters. Add five pairs, for example, and work 10, 15, 20, 40, 80, and 160 with low swr on each band. Over 200 different combinations are available, so exact operating performance may be selected. Each trap costs $18.00.

W2AU/W2VS antenna kit.

For more information, contact *Unadilla/Reyco/Inline, 6743 Kinne St., East Syracuse NY 13057; (800)-448-1666, NY/HI/AK/Canada (collect), (315)-437-3953.*

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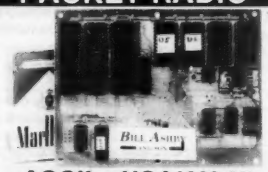

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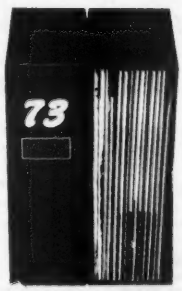

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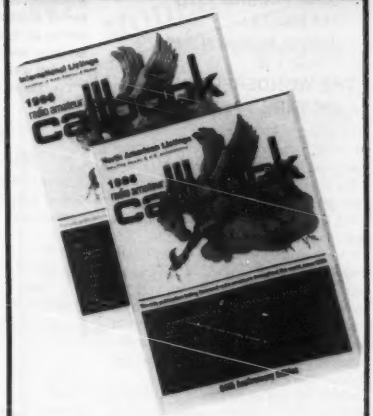

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The Callbook Supplement is a whole new idea in Callbook updates. Published June 1, 1986, this Supplement will include all the activity for both the North American and International Callbooks for the preceding 6 months.

Publication date for the 1986 Callbooks is December 1, 1985. See your dealer or order now directly from the publisher.

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FUN!

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THE WONDERFUL WORLD OF WIRE (AND CABLE)

I'm baffled. Not an unusual situation for Mr. "Fun!", I admit. But I just can't understand why our British cousins refer to the focus of our hobby as a "wireless." There must be more wires and cables in my shack than at the local phone company's switching center.

I'm not exactly renowned for my neatly dressed wires and cables. In fact, more than one person has twisted an ankle in my shack due to an encounter with the mess of wires on my radio room's floor. It raises occasional problems with my insurance company, of course, but I'm too lazy to do anything about it.

Which brings us to the topic of this month's "Fun!" column—wire. All of us live with wires every day, unless one has a severe mental problem, I suppose. Still, leave it to "Fun!" to bring a burning issue like wire into your shack and to your immediate attention. So put down that smoldering soldering iron, say 73 to that rare one on 20, and kiss the children good-bye. Sit down and read all about the wonderful world of wire.

Like I said, I'm baffled.

ELEMENT 1
MULTIPLE CHOICE

1) Approximately how much resistance (in Ohms) is there per 1,000 feet of 10-gauge copper wire?
   1) 1
   2) 10
   3) 100
   4) 1,000
2) What is the approximate loss of 50-Ohm RG-58/U in dB per 100 feet at 144 MHz?
   1) 1
   2) 4
   3) 6
   4) 8
3) Those old wire audio recorders used:
   1) steel wire
   2) copper wire
   3) aluminum wire
   4) iron wire
4) Which of the following substances can be a cable dielectric:
   1) a solid
   2) a liquid
   3) a gas
   4) all of the above
5) Faraday's famous ice-pail experiment:
   1) proved that conductivity is unaffected by ambient temperatures
   2) proved that charges reside only on the outside of conductors
   3) proved that wire can be drawn more accurately in a cold environment
   4) helped the ol' physicist make delicious ice cream

ELEMENT 2
TRUE-FALSE

	True	False
1) A composite cable contains one conductor made from multiple materials.	____	____
2) A composite conductor contains strands of different metals.	____	____
3) In the old days, hams used to wire high-voltage sections with nichrome wire.	____	____
4) A zepp is a type of wire antenna.	____	____
5) Dielectric dispersion is the variation of the dielectric constant with frequency.	____	____
6) Wiresonde is a system for transmitting meteorological signals through a cable within an airplane.	____	____
7) The "whisker" in an old cat's-whisker detector was a fine wire electrode.	____	____
8) Cable Morse code was used primarily in undersea telegraph applications.	____	____
9) The old "cactus needle" phonograph styluses were made from actual cactus needles.	____	____
10) The terms "cable loss" and "cable attenuation" are synonymous.	____	____

ELEMENT 3
MATCHING

Match the metal type in Column A with the correct relative conductivity at 68 degrees F in Column B (Copper = 100).

Column A	Column B
1) Aluminum	A) 65
2) Brass	B) 33
3) Gold	C) 15
4) Lead	D) 106
5) Nichrome	E) 28
6) Nickel	F) 55
7) Chromium	G) 16
8) Silver	H) 2
9) Tin	I) 13
10) Molybdenum	J) 59
	K) 7

ELEMENT 4
FILL IN THE BLANK

1) Another term for "dielectric constant" is _____.
2) A wire cloth is usually an _____ _____.
3) The careful arrangement of wires in a chassis is called _____the wires.
4) Unavoidable resistance in the wires within a circuit and in other hardware is often called _____ _____.
5) A wire duct is also a _____.

THE ANSWERS

Element 1:
1—1, 2—3, 3—4, 4—4, 5—2.
Element 2:

1—False	It contains multiple conductors.
2—True	In parallel, of course.
3—False	Not unless they wanted their projects to explode in their faces.
4—True	A horizontal half-wave wire antenna, to be more precise.
5—True	Important to remember on VHF and up.
6—False	From a captive balloon to the earth.
7—True	Pressed against a crystal.
8—True	It was a three-element system in which dits and dahs of equal length were represented by positive and negative pulses.
9—True	A far cry from the laser pickup in modern compact disk systems.
10—True	You bet. They both stand for a reduction of signal.

Element 3:
1—J, 2—E, 3—A, 4—K, 5—H, 6—C, 7—F, 8—D, 9—I, 10—B.
Element 4:
1—permittivity
2—electrical shield
3—dressing
4—wiring resistance
5—conduit

SCORING

Element 1:
Five points for each correct answer.
Element 2:
Two and one-half points for each correct answer.
Element 3:
Two and one-half points for each correct answer.
Element 4:
Five points for each correct answer.

How did you do?
1–20 points—You use wire cutters as nail scissors
21–40 points—You think that a wire is the same as a telegram
41–60 points—You know there are wires in your shack, but you're not quite sure what they do
61–80 points—You think that point-to-point wiring is a gas
81–100 points—You love wire so much, you save little snippets of it for future projects

SATELLITES

USING THE AO-10 APOGEE PREDICTIONS

Apogee predictions for the month of November are provided for three sections of the United States: Washington DC at 39N 77W, Kansas at 39N 95W, and California at 38N 122W. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

AMSAT-OSCAR 10 APOGEE PREDICTIONS
NOVEMBER 1985

			WASH		KANSAS		CALIF	
ORBIT	DAY	TIME	AZ	EL	AZ	EL	AZ	EL
2124	1	0600			229	4	207	18
2126	2	0500	235	0	221	11	196	22
2128	3	0500	229	2	215	12	189	21
2130	4	0400	221	9	205	17	177	23
2132	5	0400	215	11	199	17	171	20
2134	6	0300	206	16	188	20	160	19
2136	7	0200	195	20	176	21	149	16
2138	8	0200	189	19	170	19	144	11
2140	9	0100	177	20	159	17	135	6
2142	10	0000	166	20	148	14	127	0
2144	10	2300	155	17	139	9		
2146	11	2300	150	13	135	5		
2148	12	2200	140	9				
2150	13	2200	136	4				
2152	14	2100	128	0				
2157	17	0700					228	4
2159	18	0600					220	10
2161	19	0600					214	12
2163	20	0500			227	3	204	17
2165	21	0400	233	0	219	10	194	20
2167	22	0400	227	2	213	11	187	20
2169	23	0300	219	8	203	16	176	21
2171	24	0200	210	14	193	19	164	20
2173	25	0200	204	15	186	18	159	17
2175	26	0100	193	18	175	19	148	13
2177	27	0000	182	20	164	18	139	8
2179	27	2300	171	20	153	16	130	3
2181	28	2300	165	17	148	12		
2183	29	2200	154	15	139	7		
2185	30	2200	149	11	135	2		

HAM HELP

I need a schematic and manual for my Type 310 Tektronix oscilloscope. I will gladly pay all costs.

Vernon R. Davy
7915 West 91st Terrace
Overland Park KS 66212

I would like to modify a Fire Bird model F-50BM CB amp for 6 meters and need a manual or schematic.

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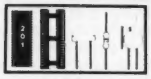
TOUCHTONE™ DECODER KIT



- MODEL TTK -
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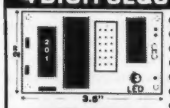
- SSI 201 DTMF Receiver
- Receive all 16 DTMF digits
- No additional filtering
- Output BCD or hex format
- Low power (29ma @ 12V)
- Kit includes 3.58Mhz crystal, 22 pin IC socket, resistor, capacitors, data sheet and schematics

4 DIGIT SEQUENCE DECODER



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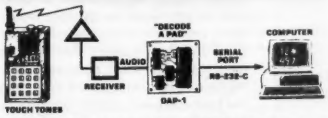

- **Use your computer to decode DTMF touchtones.**
- Receive all 16 digits as fast as they can be transmitted.
- Easily program your computer in BASIC to decode multi-digit "strings", display digits, sound alarms, observe secret codes, control relays, remote base.
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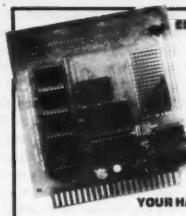

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'REMOTE A PAD®' MODEL RAP-1

2 FOUR DIGIT DTMF DECODERS, PLUS 16 DIGIT KEYPAD CONTROL

TUNE THE WORLD FROM YOUR HANDHELD VHF/UHF RADIO

- Audio tones from any source, are converted to solid state switches which control any 16 digit keypad of a radio or other device.
- Some examples you can control include the Pro-Search™ Rotator (rotate beam remotely), ICOM IC-701 or ICOM IC-211 when using the RM-2 controller; ICOM 7950 & 751, Azden PCS 4000, handhelds such as Yaesu FT-708, FT-708, ICOM IC-02AT, and many more.
- Anything you can do manually with your 16 digit keypad, the RAP-1 will do remotely using audio touch tones from any source.
- Two (four digit) programmable access codes are used to operate relays or other on/off functions.
- LED decoder status indicators and momentary plus steady state decoder outputs are provided.
- 22 gold pin card edge connector, 16 pin dip socket and ribbon cable are supplied.
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- Hook eight wires (4 rows and 4 columns) in parallel with the existing keypad of the radio you wish to control remotely. Connect audio from any source, 12 volts D.C. and **you are in control.**
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ABOVE AND BEYOND

Peter H. Putman KT2B
84 Burnham Road
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This month I'd like to devote some time to a topic of vital interest to all hams, the current status and uncertain future of the 220-MHz (1.25-meter) band. Before I go any further, I'd like to add that two previous versions of this month's column were typed up and discarded—that's how fast the news has been coming in!

By now, most readers of the various amateur magazines have read about the numerous Petitions For Rulemaking (PRMs) and Notices of Proposed Rulemaking (NPRMs) that threaten to take the band away or share parts of it with other technologies. Two petitions are currently on file with the FCC to reallocate the bottom three MHz for land-mobile use (RM-4829 and RM-4831). An additional petition (RM-4983) seeks to use 350 kHz of the middle of the band on a shared basis with amateurs for a commercial data channel. The originator of this petition, Robert Snyder W9GT, does not operate 220 MHz and based his proposal on the apparent lack of 220-MHz activity he perceived from reading ham magazines and repeater directories.

The initial proposal met with a lot of objections from amateurs across the country, especially those in the congested New York City and Los Angeles areas, where 220 FM activity is high. Subsequent release of technical information by a manufacturer of geophysical location transmitters (Fairchild) revealed that their system required a bandwidth of 2.4 MHz, and to top it off there has been an upsurge in the purchase of new 220-MHz gear in the past six months. Snyder filed additional comments on his own proposal to the effect that adjacent unused TV channels might be better used in his scheme, in accordance with a similar proposal made by the ARRL. Failing that, he added, the amateur population might not object after all to sharing at least the 350-kHz service in the center of the band as opposed to losing outright 2 to 3 MHz, if not the entire band.

Whew! Heavy stuff, indeed. What makes 220 MHz so desirable, and why aren't more amateurs using the band? There are many possible answers. Let's start with a brief overview of this frequency segment and its characteristics. 220 MHz has long suffered as the "odd man out" among VHF and UHF bands because it isn't related harmonically to other popular VHF bands (as 432 MHz and 1296 MHz are). Commercial 220 equipment is scarce, and the fact that 220 is strictly a North American amateur allocation cuts into the potential market for the major manufacturers. Amateurs are a determined lot, however, and many have "rolled their own" equipment and antennas.

Propagation is very similar to 144 MHz—so much so that many hams in the know are switching their repeater operations up from 2 meters to take advantage of the quieter, less congested channels. Antennas are physically smaller (a quarter wave on 144 MHz is 19 inches; on 220 it's just 12 inches). Not only that, the TVI headaches that are increasingly plaguing amateurs in areas with cable TV are nonexistent on 220 because the highest VHF channel (Channel 13) lies just below the band edge at 216 MHz. Indeed, users of 220 near major metropolitan areas with a Channel 13 can have their hands full with front-end overload in their receivers.

Enhanced propagation occurs mostly in the troposphere, although sporadic E is certainly possible and many contacts have been made via meteor scatter. Moonbounce fans love this band, as it is relatively quiet. And with a full 5 MHz of bandwidth, there's plenty of room to accommodate all interests, from FM to weak-signal work to EME. Additionally, 220 is the lowest frequency band on which remote linking is allowed by the FCC. And although technically it is "co-shared" with the government, there is virtually no interference from other services.

So why isn't everyone rushing to get on the bandwagon (pardon the pun)? It could be the lack of equipment. Although there are those who would say that a real ham builds when nothing is available, the reality today is that most people would rather spend the money and buy it ready to go. I certainly couldn't build an IC-37A for three hundred dollars if I had to! Several manufacturers do make excellent FM transceivers for 220, among them ICOM (the aforementioned IC-37A and the IC-3AT), Santec, and Azden. Kenwood's new TH-31 is a big hit due to its small size. And of course, there are the venerable Midland 13-509 and 13-513 transceivers of a few years back when it looked like a no-code 220 license was going to become a reality. Yaesu did manufacture a 220 radio several years back and has come out with a new model (FT-103). Yaesu is actively soliciting comments regarding a 220 module for their extremely popular FT-726R multimode transceiver.

All fine and dandy, except these radios, with the exception of the possible 726R module, are all FM only. What about SSB? CW? Even AM? Here's where things get a bit sticky: There are no 220-MHz multimode radios on the market as of this date, although ICOM solicited comments from visitors to their booth at Dayton regarding the viability and suitability of a 220 multimode. They've just announced a multimode for 1296 MHz (IC-1271), and although the 1296 (23-cm) band is a worldwide allocation, I can't help but wonder if the market is as big as that for a 220-MHz multimode.

The other option would be to build or purchase a 220-MHz transverter to use with an appropriate low-band radio. There are a few sources for these units, such as Hamtronics in Rochester, New York, and Transverters Unlimited of Toronto, Ontario, whom we'll get back to in a moment. There have also been rumors that SSB Electronics of Germany is considering a 220-MHz transverter for the US and Canadian market. Such transverters typically put out 2 to 15 Watts and can be used with many of the popular solid-state amplifiers, such as Mirage. One advantage of using a transverter is the low initial cost to get on the band, provided you already have a low-band transceiver with the appropriate connections. Or you can use a 50-MHz multimode to drive the transverter if you wish.

Hmmm. We still haven't come up with the answer. There's certainly enough equipment to get started, although not anywhere near the selection available on other bands. And the band seems relatively free of congestion. Antennas certainly aren't a problem, as KLM, Cushcraft, Larsen, and others all make a variety of 220 models. So what is the reason that more people aren't on 220?

Ready? The answer is . . . I don't know. Neither does the ARRL, the FCC, nor any of those Japanese manufacturers. If 220 MHz was a Japanese allocation it would be jammed full of amateurs by now. We'd have our pick of multimodes, handie-talkies, repeaters, peripheral equipment such as computer interfaces, antennas, amplifiers, you name it. It's hard to conceive that a band such as 220 situated where it is with its propagation characteristics and bandwidth of 5 MHz lies mostly dormant with the exception of FM activity in the major population areas. And this is precisely why there are so many who desire to take away some or all of the band for commercial uses—because it just isn't being used.

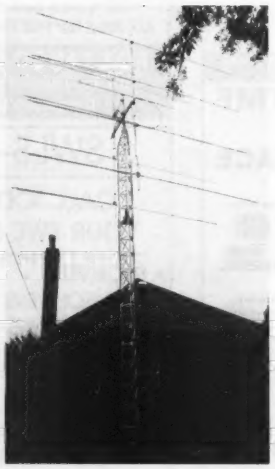
Now for the bombshell. As you have heard by now, the ARRL has proposed (RM-5038) to allow Novices voice privileges on 28 MHz, 220 MHz, and 1200 MHz. Stating that many Novices drop out after obtaining their licenses, and that if amateur radio is to grow and prosper in the future it will be through the Novice ranks, the ARRL makes a convincing case for the proposal. Consider this: With the sunspot cycle at the absolute bottom, propagation on two of the Novice bands is terrible (15 meters and 10 meters). Add the QRM on 40 meters from foreign broadcast operations and QRM from Canadian phone operations on 80 meters. What's a Novice to do? With many Novices living in apartments, condominiums, and dwellings where antennas are severely restricted, it certainly adds up to a high dropout rate.

Not only that, but using CW exclusively deprives the aspiring amateur the chance to improve his or her phone techniques! A voice allocation on 220 MHz would do exactly that. Under the terms of the proposal, Novices would be limited to 25 Watts on 220 but could use repeaters (although not be a trustee of one). Art Reiss K9XI makes an excellent point in his *220 Notes* for August, 1985, and that is that with the emphasis away from public service on CW and towards the VHF handheld radio, allowing Novices to use 220 FM provides a large cadre of operators whose talents and willingness to help would otherwise go to waste.

For those with an interest in computers, 220 is fast becoming a hotbed for packet-radio activity. Many new Novices share this interest in computers, and a 220 digital privilege could be just what the doctor ordered. The point to be gleaned from all of this is that giving Novices these privileges means more activity on 220 and more active hams in general. And more activity on 220 means we can stop worrying about losing this allocation and get on to more important matters that face amateurs today. The ARRL proposal is one of the best things—indeed, the best thing—I've seen come out of Newington in a long time. It deserves your support.

What's a good way to get active on 220 with a minimum of cash outlay? If you are into repeaters, then a hand-held might be your best choice. But here's a better idea: If you already own one of the newer all-mode low-band transceivers (ICOM 751, 745, Kenwood 430, 930, Yaesu FT-757GX), then the answer might be a transverter. This ingenious device mixes low-level rf from your HF transceiver wtih an on-board local oscillator to produce coverage of the desired band segments on 220. Best of all, you retain the modes of operation on your

Hans VE3CRU fixing a sick 1296 Microwave Module.



The EME array at VE3CRU. On 432, Hans uses 1.5 kW into eight 32-element yagis and has worked Australia, Japan, and Germany.

HF transceiver because the transverter is *linear*. That means you can work 220 SSB, CW, AM, and even 220 FM.

Where do you get one of these magical boxes? One source is Hans Peters VE3CRU of Transverters Unlimited in Toronto, Ontario, who has been custom building his own 220-MHz versions of the popular Microwave Modules for some time now. The factory in England doesn't make a 220-MHz model, so Hans uses identical parts and cases made in the US and Canada to make his modules. He started this enterprise back in the late 70s after tearing his hair trying to locate a 220 transverter, and the results have been surprising.

The basic "Canadian" Microwave Module comes with a choice of two i-f frequencies: 28 MHz and 50 MHz. Hans recommends the latter due to improved spurious rejection. He works out of his house in what can best be described as a "well-equipped basement," complete with a machine shop and all sorts of test gear. Hans normally orders parts for about 50 to 100 transverters at a clip and spends a good deal of his free weekend time building them up. The newest versions develop typically between 15 to 20 Watts of output and use high-performance MOSFETs in the front end. Add a 13.8-volt source and an antenna, and you're on the air for about $220, which is very reasonable.

Note that with conventional radios using 28-MHz i-f's, coverage of any 2 MHz of the band is possible. But by adding a second crystal in the local oscillator and a front-panel switch—similar to the 432 "S" transverter with OSCAR coverage—you can select a different band segment. By using such a switch with a continuous-coverage HF transceiver, the 27–30-MHz segment translates to 220–223, 221–224, or 222–225 MHz. By employing the FM mode on the HF transceiver, you can now work repeaters and FM simplex. Pretty neat, eh?

By using a 50-MHz i-f, coverage of any 4 MHz is possible. Most 50-MHz multimodes have an FM option installed or available. And it will give you something to do when six meters is quiet. Hans pretty much lets the buyer decide the i-f and will install the dual selectable crystals if desired for a small additional price. He does not advise using a 144-MHz i-f due to the inability to produce a "clean" signal with spurious emissions suppressed sufficiently. One additional feature on the 220-MHz modules is the ability to select separate transmit and receive connections at the desired i-f frequency, so you could use a separate transmitter and receiver, if desired. Or, if you wish to operate transceive at the i-f frequency (as the ICOM 751 and 745 do), a single connection can be made to the module.

Hans also carries other products of interest to the VHF/UHF enthusiast, among them a brand-new water-cooled 1296-MHz 250-Watt amplifier for around $250. Being an avid moonbounce operator and chaser of grid squares on 432 MHz, Hans is no stranger to the ins and outs of the higher bands. When I visited him recently, I brought along three Microwave Modules for a "tune-up"—1296, 144, and 220—and was I surprised to watch him strip down and rebuild the 220 module in about 40 minutes! Apparently the unit I had bought used was an older model and many production mods had been made in the intervening years. Hans wound all of the new coils from memory, which shows you how many times he's been inside one of these black boxes. Sure enough, the new unit exceeded specifications, developing 30 dB of gain at the i-f port and making 13 Watts across a 50-Ohm load.

Hans is also a member of the active contest group VE3ONT, which many of you may recognize from the June and September contests. He's busy chasing VUCC on 432 MHz with his moonbounce setup (despite a minor setback when his tower fell on his neighbor's house) and uses an 8938 tube at 1500 Watts to eight 32-foot homebrew yagis to work EME. Look for him on 432 in the upcoming contest season, and if you want to know more about the 220 transverters, 1296 amplifiers, or other products he carries, write to him at: Transverters Unlimited, PO Box 6286, Station A, Toronto, Ontario M5W 1P3.

Want to run more power on 220? There are many ways to do it and several manufacturers of 220-MHz solid-state amplifiers. But perhaps the best deal to come out in a long time can be found at Fair Radio Sales in Ohio. Their 1985 catalog features the AM-6155/GRT-22 UHF power amplifier with power supply for just $159.50. This unit was originally made for the FAA and uses an 8930 tetrode (available from Eimac, and one is included), but as it comes it develops 50 Watts out for 10 Watts of drive. Obviously it has been set up for derated service! With a few simple modifications, this same unit will produce between 300 and 400 Watts of output with a drive level of just 4 Watts. The power supply is sturdy enough for this power level, although increased drive just pulls the plate voltage down.

The modifications are not difficult and it will take a modest amount of time to make the stock unit into a reliable workhorse amplifier. One bonus is that the AM-6155 unit utilized a tunable cavity to cover the intended frequency range, but by changing the position of the plunger in the cavity, operation can be had on 144 MHz as well. I'll cover these modifications in more detail in the next column. Make sure that if you want 220-MHz and/or 144-MHz operation, you purchase the AM-6155 and *not* the AM-6154, which will cover 144 MHz only (and costs more to boot). The source for these surplus units is: Fair Radio Sales, PO Box 1105, Lima OH 45802.

This month we hear from the Southern California Six Meter Club about a sensational two-meter opening between Hawaii and San Diego. (Seems like a logical place to hear about two meters!) Bob Hastings K6PHE and his wife Gracie N6FSL both received 5 × 5 reports from KH6IAA and KH6HME. For those of you who just dropped your HTs on the floor in shock, I might add that this path has also been worked on 220, 432, and recently on 1296 MHz! The cause is tropospheric propagation in the form of an enormous duct to cover the 2500+ miles. A similar duct has been observed between Bermuda and many stations on the East Coast on 144 MHz and 432 MHz. SCSMC is an active group that publishes a very nice looking newsletter which is professionally typeset and features articles about six-meter repeaters that can be worked via sporadic E in Washington, as well as a schematic for a 6- and 2-meter duplexer for mobile use. Look for them on 6-meter SSB when the band opens, and I'll look for you next month "Above and Beyond."

Additional note: An excellent source of information about the 220 band and the fuss in Washington is the *220 Notes*, published by Art Reiss K9XI. A one-year subscription costs just five dollars for six issues. For more information, write: Walt Altus WD9GCR, 215 Villa Road, Streamwood IL 60103.

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RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
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OK, Apple owners, this month is your turn! We are going to take a look at some of the material you have sent in on the various RTTY programs for the Apple. If I can draw one theme from it all, you all seem disappointed.

Although the Apple II and various offspring have at times been felt to be some of the most popular home computers ever made, viable RTTY software for the Apple, at this point in time, seems to be scarce, according to information received here.

First on the list is a program which several hams call the "Galfo" program. I have no other information than that, not full name, nor source, nor price. I even don't know if it is still available. One ham calls it "fair," another tried it and switched to one of the other programs described later. If any of you readers can supply specifics, I would be glad to report on it.

Next comes a program called SuperRATT. Quite a bit was written about this program some years ago, and it appears that quite a few of you are using it. Unfortunately, the publisher can no longer be found. Another one for the shelves, I guess.

You know where that leads us? Back to Kantronics, the source of some of last month's software, to look at two of their products, Hamsoft and Hamtext. Hamsoft, Kantronics' basic RTTY program, includes a split-screen display using the standard Apple screen, a type-ahead buffer, and message ports. However, some of you do offer rather pungent comments about this program. One ham related that he thinks the "...software is sadly deficient. It makes no use of my 80-column card, no upper- and lowercase in ASCII. It makes no use of the disk drive. Storage of incoming RTTY would make me very happy. I would prefer to store RTTY art, computer programs, weather, news, and other information gathered from the radio onto disk. This would give me the ability to edit out useless info on a word processor before printing. I really hate to retype programs. I would love to come home from work and read a disk's contents. I have tried just leaving the printer on all day and returned to find a 200-sheet stack of paper eaten up by a civil-defense network. I imagine that hams would be disappointed with this software—especially if they didn't own a printer."

The next step up is to Kantronics' Hamtext program. This program allows tape and disk transfer, printer outputs, and more. More? Well, one of you detailed what happened when you went looking for a better RTTY-trap. "Imagine my surprise when I opened the package and found not only the expected disk, cable, and manual, but also a printed circuit board that had to be put into one of the expansion/interface slots in my Apple IIe. Nary a word in the advertising material alluded to that method of interfacing. I really suspected it to be a method of copy protection. But to my pleasant surprise there was also a simple clock on the Hamtext interface board. Lack of a clock in the Apple had been a very sore subject with me, as all my friends with cheap Commodore machines had clocks in all their simpler programs. There is also a printer connector on the board which I have never found any reason for."

"My original Hamtext did not include AMTOR. I found that Kantronics was willing to add AMTOR to the disk for a reasonable sum so I sent it in to have it added. When it arrived, it would not boot the menu and the 80-column mode wasn't just right, so back it went. To their credit they sent me a loaner program while they worked on the bugs in mine. Later I got mine back and returned their loaner disk."

"The Hamtext program will not allow relaying incoming data, but data has to be saved and called up from a disk file for transmitting. Message ports cannot be loaded without leaving the T-R mode, so you cannot put in the call, etc., of the station you are working. I work other guys who have those features. It's enough to drive one to a dedicated RTTY terminal unit of some sort."

One of you loves to operate his Apple on VHF, and only VHF, RTTY. "My enthusiasm with RTTY on VHF is a product of the fact that my Apple puts up an incredible amount of interference with the HF radio. I have tried everything to cut down emi and have resorted to tuning up a signal on the interface and taping it for later perusal. This also keeps me from printing up reams of unusable stuff (*that's one solution—MIL*). I have grounded everything, wrapped all of the cables in aluminum foil, and grounded that. I am considering mounting the Apple in a shielded box with an external keyboard and I/O ports in the open."

I hear you, and I hope the manufacturers do, too. My thanks to Dave Brown W9CGI, Ben Irvine N3CNH, Paul Mellinger NI6P, William Schmit, and all the others who volunteered information about the Apple on RTTY.

On a related front, several of you have dropped me notes regarding some of the schematic diagrams printed here which have been drawn by computer. Well, I have been playing with a new tool for this which makes the job even easier. Using the superior graphics capabilities of the TRS-80 Color Computer®, the Schematic Drafting Processor by Tony DiStefano (and marketed by Spectrum Projects) does for drawing schematics what a word processor does for writing articles.

Features of this program include the ability to place any of thirty predefined schematic symbols anywhere on a worksheet which measures 480 by 540 pixels in size. Logic gates, integrated-circuit chips, resistors, and more are all preloaded into the system and can be placed with the movement of a joystick cursor and a few keystrokes. Special symbols can be defined and loaded in for specific applications.

There are routines in this program to dump the full worksheet to a printer, as well as to save it to disk. The only problem I can see is that the SDP is set up to use the standard CoCo "bit-banger" printer port. Many of us are using other interfacing techniques, including parallel PIA ports. The SDP will not address these. Nonetheless, at under thirty dollars, this is a superb addition to the library of an electronic enthusiast.

Another sleeper discovery for the CoCo, by the way, goes under the mysterious code number of 277-1019. You will find it in your local Radio Shack, no doubt, called a "Computer Keyboard QWERTY format—57 keys." What you may not realize is that this was the keyboard for the Super-CoCo that was never made. Sporting an ALT, Control, and two Function keys that current CoCo software does not support, this keyboard drops into the newer CoCo boards. With some creative software, and if (I don't know) the programs used for the other keyboards with Function keys will work, this makes quite a nice upgrade. The price? How does $4.95 grab you? That's not a misprint—under *five bucks!* Check it out.

Don't forget the Postal Service and CompuServe connections for getting in touch with me. Send letters to the above address, with a self-addressed, stamped envelope for replies. CompuServe EasyPlex can be addressed to ppn 75036,2501. Either way, I'll try to answer as soon as I can. And again, if you want a current reprint list, just drop me a note, with an SASE, and I'll send the list by return mail.

Here is the list of companies mentioned today, that I know you can get ahold of. If the publishers of the programs mentioned above and not listed below wish to send me current information, I will be delighted to print it when received: Hamsoft and Hamtext, *Kantronics, 1202 E. 23rd Street, Lawrence KS 66046*; Schematic Drafting Processor, *Spectrum Projects, PO Box 21272, 93-15 86th Drive, Woodhaven NY 11421.*

Once again, when you contact these folks about their RTTY equipment, please tell them that it was in *73*'s "RTTY Loop" that you saw it mentioned, OK? You understand, it's not for me, but to allow the manufacturers to know where the amateur community gets its information, so that they might tailor their direction for their next product line. And, of course, where else to read about that new and exciting piece of RTTY gear? Right here, in "RTTY Loop."

LETTERS

SEGREGATE NOVICES

I am very interested in the proposition of a Novice phone allocation on the higher frequencies to encourage would-be amateurs. Look at what vfo operation and the raising of the 75-Watt limit did for the Service.

I think that with today's state-of-the-art radios it would be a fine thing to allocate some phone privileges to them, like a carrot on a stick. However, I do *not* go along with letting any of the higher-class licensees indulge in their allocation. Keep it strictly for Novice operation. This would let them keep all of their contacts on a Novice plane, to exchange information. Outside of this, I think it would be a grand opening for beginners.

Jack Golden KK2W
Portville NY

Great idea, Jack. And while we're at it, let's make the General subbands General-only. Likewise the Extra and Advanced portions. That way, you and I can keep our contacts on an Extra plane, and we won't be bothered by those rotten lower classes, right? How are the Novices going to learn proper techniques unless we teach them? And how can we teach them if we can't contact them? Call them on the phone? —KW1O.

DROP NOVICE TICKET

With regard to the proposed expansion of Novice privileges, I fail to see the real benefit in offering something extra to someone who has no idea of what ham radio is and, therefore, no interest in the hobby. An increase in our ranks is not going to come from either fewer restrictions or more privileges. Go ahead and offer anything you want to the man on the street, and then ask him if this would entice him to become a ham. You're going to get one of three answers: "Yes," "No," or, "What's ham radio?" If we haven't yet explained what the refrigerator is, who will care that it comes with an automatic ice maker? And once you've explained things, how do you convince him that he wants it?

The young kids of today are involved with computers—they've been getting beat over the head with them since the advent of the pocket calculator. "Computer Literacy" has even become a required course in some schools. I haven't seen any ham-equipment manufacturers following IBM and Apple's lead and donating or discounting gear. The competition with other hobbies is fierce, but we are not even advertising—and we have a 400,000-person sales team!

As for the proposal itself, I'm beginning to feel like I've been had. We've argued no-code until we can't stand it anymore and now this compromise comes along hot on its heels. Are we still smarting enough from the no-code fiasco to agree on any proposal that comes up? Is somebody pulling a New Coke/Classic Coke marketing ploy on us?

If you want to make the first ham ticket more inviting by broadening the privileges, why reinvent the wheel? Just dump the Novice ticket and make the first license the Technician class. With that you've given the newcomer all of the privileges from 6 meters on up plus CW on the HF bands. The combined Novice/Technician test would be one that's worth its salt, there would be only a minimal change in regulations, we wouldn't have even more confusing subbands, and there's still an incentive to upgrade.

Since it is the only alternative at the moment, I'll support the proposal as written, but I can't help feeling that we aren't seeing the forest for the trees. The problem is not that the Novice license doesn't offer enough, it's that the non-ham doesn't know what ham radio is. Actions speak louder than words, folks. Forget the many pages of legalese and do a little PR work at the grass-roots level.

William Itter N9EWA
Schaumburg IL

ADD EXHAMINATIONS

I have just finished reading the August, 1985, issue, and the letter from WA2VPH on state-of-the-art equipment got me thinking. He is absolutely correct in saying that practically no one can repair their equipment anymore. The sophistication of

the integrated circuit has ensured that. As a result, probably 80% of active amateurs are simply operators. Even the license tests are really a matter of memory, guesswork, and luck. Little, if anything, is determined by them about one's ability to demonstrate a practical application of electronic knowledge.

Maybe we need a part of the test to actually require such a demonstration. This could be in the form of troubleshooting, construction, or perhaps simple measurements and deductions obtained by using various pieces of standard test equipment on working circuits. Different classes of license would require differing degrees of difficulty. For example, a General-class test might require that, given a typical oscillator circuit, one would need to connect it to a power supply, fire it up, and determine such things as the operating frequency, power in and out, waveform, etc. With the volunteer examiner program now in place, the additional cost of providing the equipment needed for this type of test is zero. Enough of this stuff is sitting in garages right now to run the program forever.

I would also point out that the remarks made by FCC Commissioner Kowalski ("QRX," August, 1985) support this suggestion. If, by licensing amateurs in this manner, it could be demonstrated that a national capability is being increased by providing a group of citizens who have shown some technical skills, this demonstration alone would separate hams from other users of the spectrum. A skilled ham contributing to and increasing our national human resource is much more difficult for Congress to eliminate than a bunch of hobbyists.

Everyone is looking for a way to upgrade and expand the participation in the Amateur Service. If the license actually had some value indicating that the holder possessed some skill or proficiency (other than the ability to send and receive Morse code), maybe those talented youngsters who have deserted us would return.

D. S. Jenkins WA8OGH
Tarzana CA

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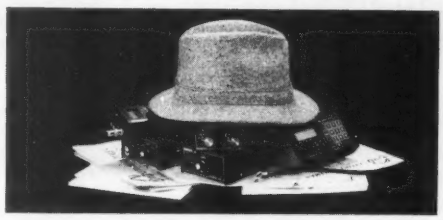

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NEW PRODUCTS

NONCONTACT VOLTAGE DETECTOR

A hand-held instrument that emits an audible ticking sound in the presence of ac voltage is available form Louis and Beech. The Tic-Tracer can be used to safely check for live wires without touching them, to find hidden wiring, and to check fuses and breakers. The Tic-Tracer can also detect which side of a two-wire cord is hot.

The Tic-Tracer is housed in an 8-1/2" × 2-3/4" × 1" case and operates on two AA batteries.

For complete information, contact *Louis and Beech, PO Box 19580, Detroit MI 48219.*

ICOM IC-1271A

ICOM has announced the IC-1271A 1.2-GHz transciever. The unit covers 1240 to 1300 MHz with 10 watts of output. Features include 32 memory channels, scanning, multimode operation (including ATV), and a GaAsFET front end. Options available are the TV-1200 ATV interface unit, the IC-EX310 voice synthesizer, the UT-15S CTCSS encoder/decoder, and the IC-PS25 13.8-V-dc internal power supply.

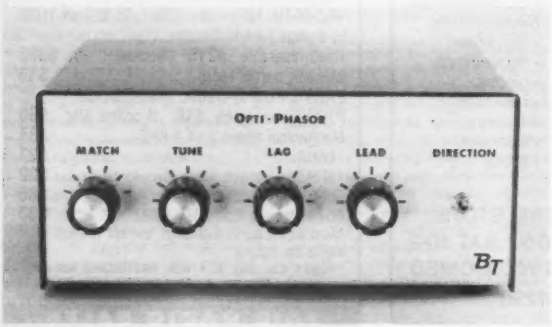
ICOM's IC-1271A 1.2-GHz transceiver.

For more information, contact *ICOM America, Inc., 2380 116th Avenue NE, Bellevue WA 98004.*

BAILEYTECH OPTI-PHASOR

BaileyTech's new Opti-Phasor is an in-the-shack 40-meter phasing unit designed to drive a pair of dipoles or inverted vees as a phased array. Variable-reactance phasing allows the antenna currents in the two wires to be precisely balanced so that a deep null and optimum gain can be achieved. A front-to-back ratio of 20 dB is typical, and the null is steerable.

For more information, contact *BaileyTech, 304 West S. College Street, Yellow Springs OH 45387.*

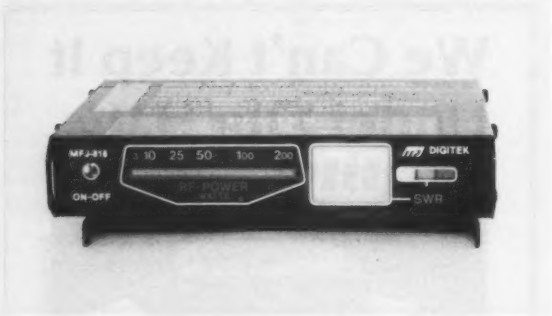


The BaileyTech Opti-Phasor.

MFJ DIGITAL SWR/WATTMETER

MFJ Enterprises has introduced the MFJ-818, an automatic digital swr/wattmeter. A 12-bar LED display shows up to 200 Watts of output power, and 1/2-inch LED digits indicate swr from 1:1 to 9.9:1. A three-color LED displays the impedance match between antenna and transmitter: green for good, yellow for marginal, and red for poor matching.

Complete information about the MFJ-818 is available from *MFJ Enterprises, PO Box 494, Mississippi State MS 39762.*



MFJ's 818 power/swr meter.

MIDLAND DESKTOP REPEATER

Midland LMR has introduced a four-channel desktop repeater for commercial two-way FM radio systems. The VHF high-band model covers 150–174 MHz with either 2–5 or 5–35 Watts of output, and the UHF model covers 450–470 MHz with either 2–5 or 5–25 Watts of output. Both models will accept an optional CTCSS module. The standard units require separate transmitting and receiving antennas, but an optional duplexer permits the use of a single antenna. Both models come with one set of crystals.

For complete information, contact *Midland LMR, Marketing Department, 1690 North Topping, Kansas City MO 64120.*

Midland LMR's desktop repeater.

REGENCY Z60 SCANNER

Regency Electronics has announced the Z60 scanner/clock radio. The Z60 receives up to sixty channels on eight bands. Fifty channels may be used to monitor VHF-Low (30–50 MHz), VHF-Aircraft (118–136 MHz), VHF-Amateur (144–148 MHz), UHF-Amateur (440–450 MHz), UHF (450–470 MHz), and UHF-T (470–512 MHz). The remaining ten channels are dedicated to the FM broadcast band (88–108 MHz).

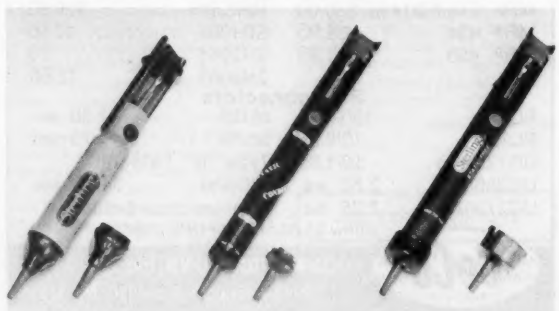
The Z60 requires no crystals and comes programmed with 60 popular frequencies. A search mode will scan an entire band for activity. Also included is a built-in alarm clock.

For complete details, contact *Regency Electronics, Inc., 7707 Records Street, Indianapolis IN 46226.*

WAHL DESOLDERING TOOLS

Wahl Clipper Industrial Products has introduced a new series of desoldering tools. Two styles feature static-free tips and one is an anti-static model. All feature high vacuum, recoil protection, and a self-cleaning plunger. All are balanced for one-hand operation and have comfortable thumb profiles.

For more information, contact *Wahl Clipper Corporation, Sterling IL 61091; (815)-625-6525.*



Wahl Clipper desoldering tools.

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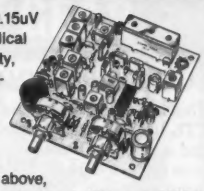
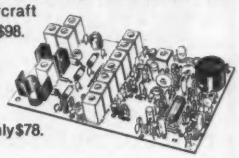


- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.;8 pole xtal filter & ceramic filter in i-f, helical resonator front end for exceptional selectivity, > 100 dB at ± 12kHz, best available today. Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit only $138.
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $138.
- **R76 FM RCVR** for 10M, 6M, 2M, or 220. As above, but w/o AFC or hel. res. Kits only $118. Also avail w/4 pole filter, only $98/kit.
- **R110 VHF AM RECEIVER** kit for VHF aircraft or ham bands or Space Shuttle. Only $98.



- **T51 VHF FM EXCITER** for 10M, 6M, 2M, or 220 MHz. 2 Watts continuous, up to 3 W intermittent. $68/kit.
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Antenna Input Range	Receiver Output
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50-52	28-30
50-54	144-148
144-146	28-30
145-147	28-30
144-144.4	27-27.4
146-148	28-30
144-148	50-54
220-222	28-30
220-224	144-148
222-226	144-148
220-224	50-54
222-224	28-30

UHF MODELS	
Kit with Case	$59
Less Case	$49
Wired	$75

432-434	28-30
435-437	28-30
432-436	144-148
432-436	50-54
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Exciter Input Range	Antenna Output
28-30	144-146
28-29	145-146
28-30	50-52
27-27.4	144-144.4
28-30	220-222*
50-54	220-224
144-146	50-52
50-54	144-148
144-146	28-30

For UHF, Model XV4
Kit $99
Wired $169

28-30	432-434
28-30	435-437
50-54	432-436
61.25	439.25
144-148	432-436*

*Add $20 for 2M input

VHF & UHF LINEAR AMPLIFIERS. Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

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MODEL	TUNES RANGE	PRICE
LNG-28	26-30 MHz	$49
LNG-50	46-56 MHz	$49
LNG-144	137-150 MHz	$49
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LNG-220	210-230 MHz	$49
LNG-432	400-470 MHz	$49
LNG-800	800-960 MHz	$49

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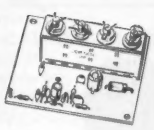

Model	Tuning Range	Price
HRA-144	143-150 MHz	$49
HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$59
HRA-( )	150-174 MHz	$54
HRA-( )	450-470 MHz	$64

ACCESSORIES

- **MO-202 FSK DATA MODULATOR.** Run up to 1200 baud digital or packet radio signals through any FM transmitter. Automatically keys transmitter and provides handshakes. 1200/2200 Hz tones. Kit only $45.
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- **COR-2 KIT** With audio mixer, local speaker amplifier, tail & time-out timers. Only $38.
- **COR-3 KIT** as above, but with "courtesy beep". Only $58.
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- **DTMF DECODER/CONTROLLER KITS.** Control 2 separate on/off functions with touchtones®, e.g., repeater and autopatch. Use with main or aux. receiver or with Autopatch. Only $90
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- **SIMPLEX AUTOPATCH.** Use with your FM transceiver. System includes DTMF & Autopatch modules above and new Timing module to provide simplex autopatch and reverse autopatch. Complete patch system only $200/kit. Call or write for details.

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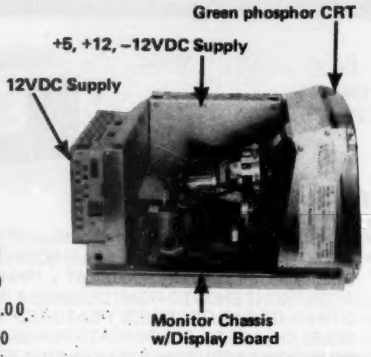

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STARLIGHT SCOPE	**SPL-130A-39**	**$1,200.00**
Optional Telephoto Lens, 135mm F2.8	**SPL-131A-39**	**$85.00**
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NATURALISTS
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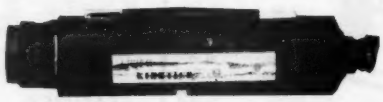

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SPL-85C-35 $175.00 each $175.00 each, 2/$325.00, 5/$725.00

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Shpg. wt. 4 lb. PS-10 $50.00

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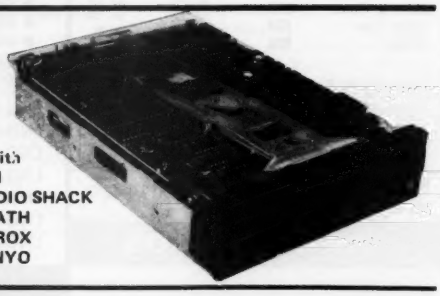

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IR Scope part no. ELD Shpg. Wt. 7 Lbs. $735.00 ea.

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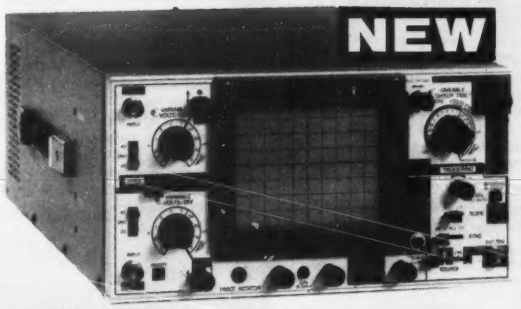
~~$309.95~~* high quality hook on probes included **$369.95**



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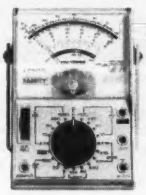

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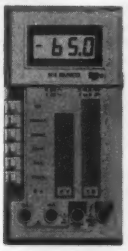

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CT-70 7 DIGIT 525 MHz COUNTER

Lab quality at a breakthrough price. Features • 3 frequency ranges each with pre amp • dual selectable gate times • gate activity indicator • 50mV @ 150 MHz typical sensitivity • wide frequency range • 1 ppm accuracy

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CT-70 kit $99.95
BP-4 nicad pack 8.95

CT-90 9 DIGIT 600 MHz COUNTER

The most versatile for less than $300. Features 3 selectable gate times • 9 digits • gate indicator • display hold • 25mV @ 150 MHz typical sensitivity • 10 MHz timebase for WWV calibration • 1 ppm accuracy

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CT-90 kit $129.95
OV-1 0.1 PPM oven timebase 59.95
BP-4 nicad pack 8.95

CT-125 9 DIGIT 1.2 GHz COUNTER

A 9 digit counter that will outperform units costing hundreds more. • gate indicator • 24mV @ 150 MHz typical sensitivity • 9 digit display • 1 ppm accuracy • display hold • dual inputs with preamps

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CT-50 8 DIGIT 600 MHz COUNTER

A versatile lab bench counter with optional receive frequency adapter, which turns the CT-50 into a digital readout for most any receiver • 25 mV @ 150 MHz typical sensitivity • 8 digit display • 1 ppm accuracy

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CT-50 kit $139.95
RA-1 receiver adapter kit 14.95

DM-700 DIGITAL MULTIMETER

Professional quality at a hobbyist price. Features include 26 different ranges and 5 functions • 3½ digit, ½ inch LED display • automatic decimal placement • automatic polarity

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The PS-2 is handy for high resolution audio resolution measurements, multiplies UP in frequency • great for PL tone measurements • multiplies by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

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The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz • flat 25 db gain • BNC connectors • great for shifting RF • ideal receiver/TV preamp

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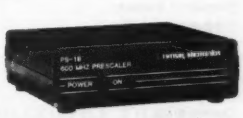

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REVIEW

IC-735
HF TRANSCEIVER

If there's a rig on the market which proves that "good things come in small packages," it's the ICOM IC-735, the successor to the IC-730. At 9" × 9" × 4" and 15 pounds, this 100-Watt HF transceiver is loaded with just about any feature an operator could want. As you would expect, CW and SSB are standard, but so are AM and FM, and it is a general-coverage receiver as well.

Among its other features are dual vfo's, 12 memories, passband tuning, notch filtering, a built-in 10-dB preamplifier, and a green liquid-crystal display which indicates frequency, mode, vfo selection, and memory.

With as many features as it has, you would think that the IC-735 would be confusing to operate. After all, there are 44 switches and knobs on the front panel—you have to admit that that number is quite high. But, after using the rig for a few minutes, the controls quickly become second nature. In fact, the labeling is so clear that you are never left wondering what a switch will do. For example, you know that ATT cuts in the attenuator and PRE AMP activates the preamplifier.

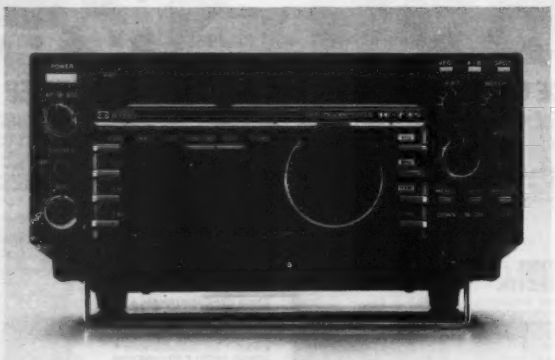
In fact, during the time I used the IC-735, I had few problems with it at all. Most of my operating was casual—a CW contact here and a phone rag-chew there. In this type of service, I found the rig much more than adequate. I would suspect that the combination of notch and passband tuning, the 20-dB attenuator, and the 500-Hz CW filter will make this a good basis for a contest station.

There is one proviso to this, though: In the presence of strong signals the IC-735 tended to pump, as if there was too much agc. I don't think the agc was the problem because I had adjusted everything according to the instruction manual. What I think was happening was that the front end of the receiver was becoming overloaded in the presence of many strong signals, and this forced the rig to pump. Flipping on the attenuator, as well as the narrow CW filter, alleviated much of this problem.

All things considered, this is a fairly minor shortcoming in an otherwise excellent piece of equipment. In fact, you can easily work around it with the existing controls. It's just that you should be aware it's there up front, rather than suspecting something is wrong and crating the rig back to the factory, when, in fact, there is no problem.

Features

For most operators, though, the IC-735 should be more than enough transceiver. With its features and microprocessor control, there is very little the IC-735 can't do. For example, it is possible to select and program up to 12 frequencies in the rig's memories. You can then select and use a memory frequency for the basis of your operation or you can choose one of the two vfo's. The memories will not only hold the frequency you've selected, but also the mode you've chosen.



The ICOM IC-735.

An interesting sidelight is the IC-735's automatic choice of the correct sideband operating position, USB above 10 MHz and LSB below. This is in agreement with international convention and it makes this rig more convenient to operate. However, if you run into a situation where you must change the sideband position—RTTY, for instance—you can easily do this by touching the SSB key and the mode will change.

One of the nicer features of the IC-735 I reviewed was its built-in electronic keyer (optional). Although you can't change the dot-dash weighting of the keyer—it's set for 3 to 1—most operators will be more than happy with the CW keyer capability of the rig.

The keyer's speed can be varied from about 10 to about 45 wpm, and while I suspect an ardent contester may want a keyer with more functionality, most casual operators should find the electronic keyer more than adequate.

One feature which I especially liked was the IC-735's full CW break-in. Simply pushing the BK IN switch (located behind a smoky plastic cover) allowed me to have full break-in, which was nice during several CW QSOs. It does take some playing with to become used to the slide adjustment for the keyer's speed, but once you've found a setting that you're comfortable with, you can set it and forget it.

Another particularly nice feature on this rig was the narrow (500-Hz) CW filter (another optional item). The CW filter enabled me to fine-tune any CW signal and eliminate just about all QRM, unless, of course, the QRM was right on top of the signal I was trying to copy. The notch and passband tuning features allowed me to vary

SPECIFICATIONS

Semiconductors:	Transistors	124
	FETs	18
	Diodes	258
	ICs (including CPU)	42
Frequency coverage (MHz):	1.8–2.0	
	3.4–4.1	
	6.9–7.5	
	9.9–10.5	
	13.9–14.5	
	17.9–18.5	
	20.9–21.5	
	24.4–25.1	
	27.9–30.0	
General-coverage receiver:	0.1–30 MHz, receive only	
Operating temperature range:	−10° C to +60° C	
Frequency control:	CPU-based 10-Hz-step digital PLL synthesizer, independent transmit-receive frequency available on same band	
Frequency readout:	6-digit 100-Hz illuminated LCD	
Frequency stability:	Less than ±200 Hz from 1 minute to 60 minutes	
	Less than ±30 Hz after 1 hour at 25° C	
	Less than 500 Hz in the range of 0° to 50° C	
Current drain:	Transmitting at 200 Watts input, approximately 20 A	
	Receiving at maximum audio output, 1.5 A; squelched, 1.2 A	
Antenna impedance:	50 Ohms unbalanced	
Weight:	5 kg	
Dimensions:	94 by 241 by 239 mm (about 4" by 9" by 9")	
Transmitter output:	SSB—200 Watts PEP	
	CW—200 Watts input	
	AM—40 Watts output	
	FM—200 Watts input	
	(power output is continuously adjustable from 10 W to 100 W)	
Emission modes:	A3J (J3E) SSB	
	A1 (A3A) CW	
	A3 (A3E) AM	
	F3 (F3E) FM	
Harmonic output:	Better than 40 dB below peak power output	
Spurious output:	Better than 50 dB below peak power output	
Carrier suppression:	Better than 40 dB below peak power output	
Unwanted sideband suppression:	More than 50 dB down at 1000-Hz af input	
Microphone:	600-Ohm electret with push-to-talk and scanning buttons	
Receiver		
Receiving system:	Triple-conversion superheterodyne with continuous bandwidth control	
Receive modes:	A3J (J3E) SSB	
	A1 (A3A) CW	
	A3 (A3E) AM	
	F3 (F3E) FM	
Intermediate frequencies:	1st—SSB, AM, FM, 70.4515 MHz	
	CW, 70.4506 MHz	
	2nd—SSB, AM, FM, 9.0115 MHz	
	CW, 9.0106 MHz	
	3rd—SSB, AM, FM, CW, 455 kHz	
Sensitivity (preamp on 1.6 to 30 MHz):	SSB, CW, 0.1–1.6 MHz, less than 1.0 uV for 10-dB S/N	
	1.6–30 MHz, less than 0.15 uV for 10-dB S/N	
	AM (narrow filter), 0.1–1.6 MHz, less than 6 uV for 10-dB S/N	
	1.6–30 MHz, less than 1 uV for 10-dB S/N	
	FM, 1.6–30 MHz, less than 0.5 uV for 12-dB Sinad	
Squelch sensitivity:	FM, 0.3 uV	
Selectivity:	SSB, CW, 2.3 kHz at −6 dB, 4.0 kHz at −60 dB	
	AM, 6 kHz at −6 dB, 18 kHz at −50 dB	
	FM, 15 kHz at −6 dB, 30 kHz at −60 dB	
Spurious and image-response rejection:	More than 80 dB	
Notch-filter attenuation:	More than 30 dB	
Audio output:	More than 3 W at 10% distortion with 8-Ohm load	
Audio impedance:	8 Ohms	

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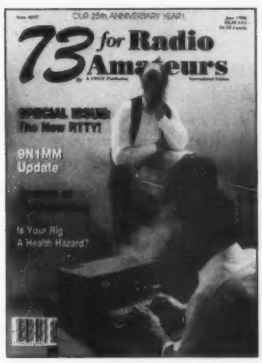

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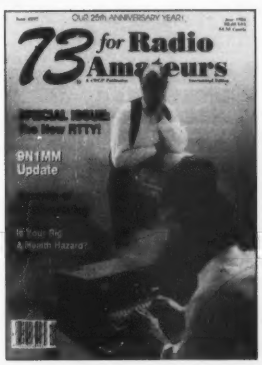

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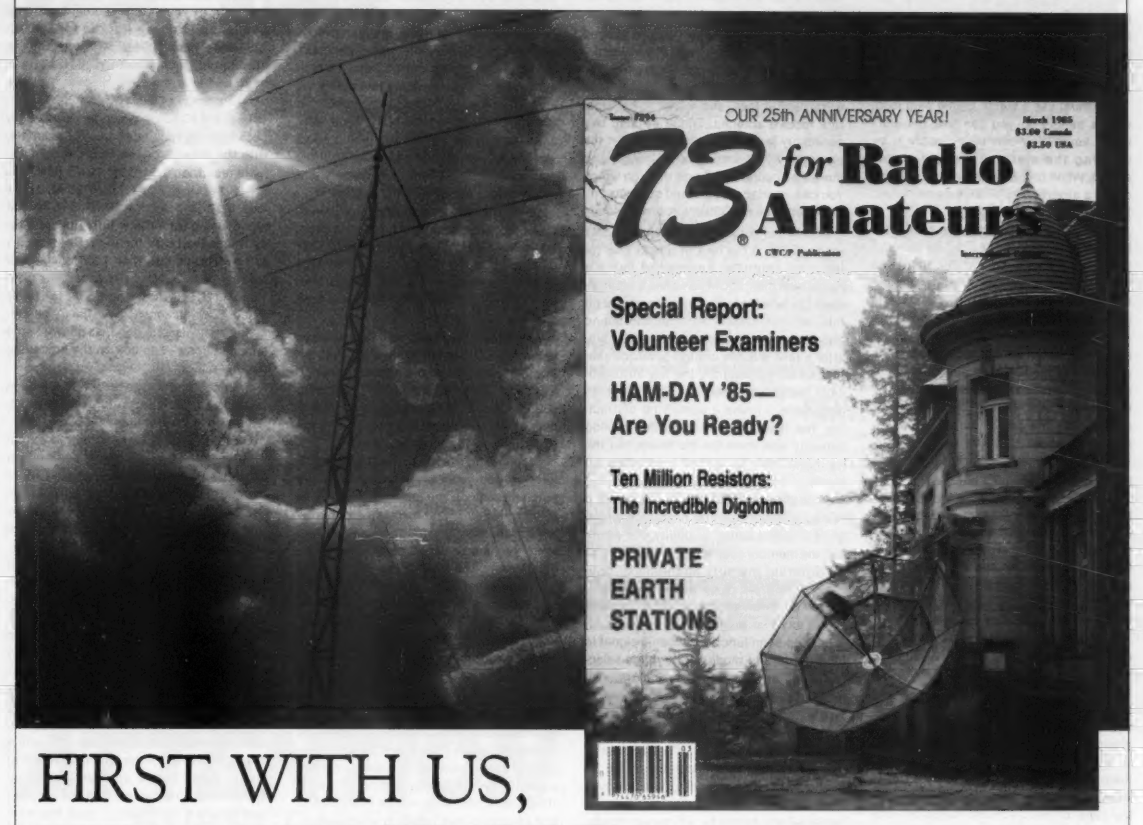

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the width of the passband to help null out QRN and QRM. When this filtering is combined with the CW filtering, I found it possible to eliminate any trace of interference to the signal I was listening to.

As I used the IC-735, I came to appreciate the work ICOM has done on it. For example, the shaping of the CW signal was the way I like it. The waveform was clean and its rise and decay times produced a clean signal. There was no chirping or ringing which would have indicated a waveform which was too soft or too sharp.

You must use a stereo phone plug to install a paddle so you can use the electronic keyer. You can also disable it by pushing the electronic-keyer on-off switch. When this is disabled, you can use either a straight key or an external keyer. The CW jack is in the rear.

Through all the testing and use I gave the IC-735 throughout the review period, I found the output to be a stable 100 Watts in all modes but AM. With the rig in the AM setting, power output was 40 Watts. ICOM rates this rig at 200 Watts input power, but a truer measure was my wattmeter, which showed a 100-Watt output. This means you can use the IC-735 to drive just about any amplifier to the legal limit. At the same time, the IC-735 can serve as a QRP rig because the power output is adjustable from about 10 Watts to 100 Watts. The control for this is located behind a plastic protective covering.

This rig was equipped with an HM-12 scanning hand microphone. This mike has up and down buttons so you can scan up through the rig's memories or through a range of frequencies and then scan back down through them again. Audio reports from other stations indicated the rig's SSB and FM audio were very good.

The power control and the others—VOX, VOX gain, anti-VOX, rf gain, ALC, CW and AM filters, CW break-in, and electronic keyer—have been grouped in a central area, which is a new idea for ICOM. These lesser-used controls are grouped into one area where they are easily accessible. However, once you've set them, you can close the panel and forget them. It certainly cleans up the front control panel of the IC-735 and leaves only the necessary controls in plain sight.

Operating Notes

After looking at other ICOM transceivers recently, I can say I like the design of the IC-735. It has everything that is standard on other ICOM HF transceivers—plus AM and FM—but in a cleaner, less cluttered, less confusing package. About the only thing I could detect that has changed between the various ICOM rigs is the lack of an XIT control, which I feel, after using the IC-735 for some time, would be a convenience, but it isn't a necessity.

On the rear panel there's the usual complement of jacks and connectors including the CW jack, an external speaker jack, ALC-Send jacks for use with an amplifier, a transverter jack, and a jack for a separate receive antenna. There are also two accessory jacks which you use to set the rig up for RTTY, among other things, and there's a special serial port through which you can interface a personal computer directly with the IC-735's microprocessor.

One of the biggest changes you'll note in the IC-735 is the lack of a heat sink for the final amplifier. Instead of using a heavy heat sink, ICOM has used a squirrel-cage fan which goes on as soon as you hit the transmit switch. At first, the sound this fan makes is barely perceptible, but, after a few minutes of high-power or continuous-duty operation, the fan automatically increases speed and this becomes noticeable. I found it somewhat distracting. Yes, it was nice to know this cooling capacity was there for the finals, but the rig didn't have to let me know quite so loudly.

According to ICOM, the IC-735 sports a newly developed central processor which gives this unit added flexibility. For example, the memory scan allows monitoring of all different memory channels or only those stored with a particular mode. Programmed scan provides scanning between any two programmed frequencies. Auto-stop scan functions when a signal is received in any mode, while mode-selective scan automatically monitors only those memories which contain frequencies with a similar mode.

This capability, though, does have a drawback, which has been pointed out in many articles and publications in the recent past: The microcoding which drives the central processor is stored in battery-backed RAM. Driven by a five-year lithium battery, the RAM is retained as long as power is applied to it. If the power is lost—a premature battery failure or some other problem—then the programming is gone and you'll have to send this rig back to the factory for reprogramming. ICOM would do well to consider using nonvolatile RAM or PROM storage for the microcode, at least.

Still, this shouldn't deter the average operator from looking at this rig. It's a pleasure to use. Major controls are grouped according to their functions. For example, the mode-select switches—CW, AM, FM, SSB—are all to the left of the protective panel. The noise blanker (whose duration can be set), attenuator, preamplifier, automatic gain control, and speech compressor are all grouped just below the display, to the left of the tuning knob. The tuning controls—kHz, MHz, ham, and scan—are to the right of the tuning knob, and the RIT, notch, and passband controls are to the right of them. The memory and vfo selectors are also in this section.

Using the ham control will allow you to move quickly through the ham bands, while the kHz control allows you to QSY quickly up a frequency range. The MHz control, as its name implies, moves from one frequency range to another in 1-MHz chunks.

One thing you should be aware of when using the RIT control is the fact that the frequency on the display doesn't change as you use it. When the red RIT LED is lit, you can move ±800 kHz. This capability isn't as wide as some rigs I've used in the past, but it is more than reasonable.

Of more importance to me are the notch filtering and passband tuning. With the notch filter alone you can introduce nearly 30 dB of filtering, and the ability to narrow the passband of the receiver is important when you are trying to copy one station out of many. The preamplifier is of benefit here, too, although I suspect it raised the noise floor enough to not only increase the signal of the weak station I was trying to copy, but also the noise level and so it almost canceled the station out.

Design

The IC-735 is a full-featured, compact HF transceiver. The transmitter covers all the WARC bands (10, 18, and 24 MHz). The general-coverage receiver features continuous 100-kHz-to-30-MHz tuning. It has a 105-dB dynamic range with a 70.4515-MHz first i-f circuit. This circuit is able to eliminate nearly all spurious responses because it was designed around two high-quality crystal filters.

Using a direct-feed mixer, ICOM has engineered a rig with a higher spurious-response rejection ratio, higher receiver sensitivity, and a wider dynamic range. The DFM circuit feeds incoming signals directly into the high-level first-mixer stage.

After the first i-f stage, signals are downconverted twice: first to 9.0115 MHz and then to the standard 455 kHz. The rig remains rock stable at all times. Our testing is pretty much in agreement with the published stability figures for the IC-735—less than 200-Hz drift one minute after turning it on, less than 30 Hz after an hour, and less than 500 Hz over the temperature range of 0° to 50° C.

That the IC-735 is a quality rig is easily seen from its specifications. For example, with the preamp on, its SSB/CW sensitivity is less than 1.0 uV for 10-dB S/N from 0.1 to 1.6 MHz. From 1.6 to 30 MHz, it's less than 0.15 uV for 10-dB S/N. In AM mode, using the narrow filter, its sensitivity is less than 6 uV for 10-dB S/N from 0.1 to 1.6 MHz and less than 1 uV for 10-dB S/N from 1.6 to 30 MHz. FM sensitivity from 1.6 to 30 MHz is less than 0.5 uV for 12-dB Sinad. Squelch sensitivity is 0.3 uV on FM.

Selectivity is also good, as shown in the specifications—see box on the preceding page.

Spurious and image-response rejection is greater than 80 dB and notch-filter attenuation is greater than 30 dB.

On the transmit side, harmonic output was more than 40 dB below peak power output and spurious output was more than 50 dB below peak power output. Carrier suppression was more than 40 dB below peak power output and sideband suppression was better than 50 dB down.

Overall, the IC-735 is a good rig. It seems to represent a new direction for ICOM: new microprocessor, new microcode, new display, and smaller packaging. The trend it represents is a trend toward simplicity and ease of use. It easily achieves those aims and it turns in excellent performance to boot.

Finally, its instruction book is fairly complete, although some of the writing could be improved. It presents you with a description of all of the salient features of the rig, some theory, and some nice cutaways of the rig, as well as a huge, but very detailed, schematic. I think the manual could be more comprehensive, especially in the theory of operation area. But, most operators should find the documentation more than adequate.

Marc Stern N1BLH
Framingham MA

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73 INTERNATIONAL

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If you would like to contribute to your country's column, write to your country's correspondent or to 73 Magazine, Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KW1O.

GREAT BRITAIN

Jeff Maynard G4EJA
32 Waldorf Heights
Hawley Hill, Camberley
Surrey GU17 9JQ
England

I am able to open this report with some really good news that reflects the excellent work done by the Radio Society of Great Britain in representing the UK radio amateur population. The UK is to be the first country in Europe with a permanent (i.e., 24-hours-per-day) allocation in the 50-MHz (6-meter) band.

The Minister of State of Industry and Information Technology, Mr. Geoffrey Pattie, recently made a statement in the House of Commons about the future plans his department has for that part of the VHF spectrum known as Bands I and III. His statement included the following definite reference to 6 meters.

. . . I am conscious that the interim Merriman Report recommended that the radio amateur service should be given an allocation in the Band I and I am therefore proposing to fulfil that recommendation by allocating the band 50 to 50.5 MHz to radio amateurs.

You will recall that to date there has been some 50-MHz activity in the UK with a selected population of amateurs having access to the band at certain times of the day.

A great deal of work will have to be done before allocation is made generally available and it may be some time before the band gets crowded! Not the least of the problems is that a number of European countries still use Band I for broadcasting and their interim needs must be considered.

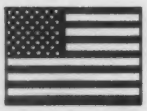
Anyone wishing to get the very latest news on this and other UK amateur-radio topics should call the RSGB's Headline News Service on 0707 59312 (the full code from the US is 1-44 707 59312).

A 50-MHz allocation available full time and to all UK operators should see some interesting propagation modes at this frequency which have not yet been fully explained.

The RSGB 50-MHz beacon, GB3NHQ, has been heard regularly on the east coast of the US. Just think what can be done with more power and some stacked beams!

The UK administration has recently decided to open up the air to youngsters aged 10 and up (previously the minimum age was 14). A full license is not available to anyone under 18; however, once the Morse test and Radio Amateur's Examination are passed, the ten-year-old can operate any station under supervision of the license holder.

By the time you read this, I will have moved house. The good news about the new location (30 miles west of London) is that it is on top of a hill with some tall trees to the rear. The bad news is that the tower is not moving. I have been persuaded that tree-born wire antennas are sufficient although I have a sneaking desire to turn to satellites as the way of achieving DX.



GUANTANAMO NAVAL BASE

Tim Miller KG4TM
Det. Guantanamo, Box 22
FPO New York NY 09563

Although you might not believe it, amateur radio is alive and well at the US Naval Base in Guantanamo Bay, Cuba.

The population of the naval base is currently about 7000 people, with fewer than 10 licensed hams. Among that group, we have everything from Novice- to Extra-class licensees.

One of the unique things about being a ham down here is that we do not fall under direct FCC jurisdiction. Our licenses are issued by the US Naval Base. In order to receive a KG4 call, a valid FCC license is required. After some simple paperwork, a KG4 call is issued. You may select your own suffix, providing it is two letters long and is not currently active. Thus we have the KG4 "2 by 2" call-letter assignment.

Along the same lines, our frequency allocations do not follow the standard FCC band plan. We are permitted to operate SSB in many parts of the US CW bands. It is therefore perfectly legal for us to operate SSB in the 15-meter Novice band.

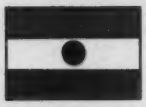
Guantanamo Bay (or Gitmo, as most of us call it) is different from most other DX areas. We are on a 48-square-mile rock with little more than coral dust to drive ground rods into. Making matters worse, our average rainfall places us in the arid zone, with most of the rain coming all at one time during the rainy season. The 90-degree temperatures then bake the ground to a rock hardness. It is sometimes a challenge to install a good grounding system!

One of the continuing problems we have at Gitmo is the high turnover of personnel. The average length of stay is 12 months if you are single or 24 months if your family is along for the tour. If you are a civilian, like myself, your tour is indefinite. It is therefore very difficult to keep an organized club station going, not to mention the headache of QSL cards getting to the proper person.

Our QSL manager, Charlie Campbell KG4CC, is always busy trying to forward all of the KG4 cards. It is a never-ending battle with the number of people entering and leaving Gitmo! So please be patient with respect to cards from Box 73. It sometimes takes a while to forward your cards to the proper place!

Guantanamo Bay may be isolated, but amateur radio keeps us in touch with the rest of the world. Some of our air time is spent running phone patches or schedules back to the States. Please respect our frequency at this time and refrain from breaking in for a signal report. Hearing from our families means a great deal to personnel down here, and the QRM just adds to the problem!

Until next time . . . Have a great day from Guantanamo Bay!



INDIA

Miss R. Subha
3, Thiru-Vi-Ka Road
Post Box 725
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India

Once every couple of years, Indian hams congregate for what is a giant eyeball QSO, educational program, and business meeting all rolled into one. The 6th All India Amateur Radio Convention (as I write this) is scheduled for the 24th and 25th of August, 1985, at Madras, the third largest city in India. It promises to be a memorable event. [For those who read this long after the event, consider it a preview of the style of the 7th Convention in 1987!]

This convention, which we expect to be inaugurated by Mr. Rajiv Gandhi VU2RG, Prime Minister of India, will be the meeting point for nearly a quarter of all the licensed amateurs in India. The first day will see a number of lectures with demonstrations on *avant garde* techniques such as AMTOR, packet switching, SSTV, and computer-oriented activities. Also to be discussed are the more mundane topics such as the QSL Bureau and the licensing system.

In a high-tech contrast to the traditional technical programs, the second day begins with a seminar on "Communications in the Year 2000," with emphasis on space communications. Scientists and hams from the Indian Space Research Organization (ISRO) will play a prominent part in this seminar, which is cosponsored by the Institute of Engineers (India), the Institute of Electronics and Telecommunications Engineers (IETE), and the Institute of Electrical and Electronics Engineers (IEEE).

The participants in the business meeting in the afternoon will be nominees of the affiliated clubs, which can send one nominee for every 50 members or part thereof. The giants among these clubs are the founder societies, the Radio and Electronics Society (Bombay), the Madras Amateur Radio Society, and the Bangalore Amateur Radio Club. They will elect a new executive committee and a new president to succeed M. V. Chauhan VU2MV. Indications are that there will not be many takers for this position, which now requires a large share of the incumbent's time.

The registrants not attending the business meeting will view a program of ARRL and WIA videotapes. The valedictory session will begin with the introduction of the new team which will lead the Federation for the next two years and will end with a valedictory address by a prominent engineer-ham.

The convention will make it possible for the registrants to match callsigns and voices with faces. With hundreds of new callsigns active on the bands, this could indeed be a memorable experience.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

A few years ago, the NZART Council decided to centralize its headquarters in Upper Hutt, near Wellington, and leased office space in a city building, Astral Towers. There, it set up the HQ office under General Secretary Neville Copeland ZL2AKV.

In the ensuing years, the operations of NZART HQ have outgrown the original office suite, and recently the landlords offered increased space on the sixth floor, almost doubling our HQ floor space to 768 square feet. The offer included (at the owner's expense) the erection of an attractive new entry to the NZART office from the lift lobby and the provision of carpet, lighting, and partitions to meet NZART requirements. It was too good to refuse, and the Council accepted the offer last November.

Relocation took place in February/March, 1985, with the General Secretary and a team of Upper Hutt amateurs doing the necessary stripping down, shifting of office furniture, re-erecting of shelves, and relocation of stock and records. GenSec Neville left the workers in no doubt that he could use hammer and screwdriver equally as well as he could pound his typewriter or, indeed, his Morse key.

The relocation has allowed more space for storage of records, a larger area for the display of publications, and also a feature area for the display of the NZART Honors Board, contest and awards trophies, and general memorabilia.

INCREASE IN LICENSE FEES

Commencing 1 July this year, ZL amateurs will have to pay more for their annual license—it now will cost NZ$20.00 (approx. US$40). The Amateur Operators Certificate Examinations will be NZ$15.00 and the Morse Operating Test only, NZ$7.00.

The NZART Council objected very strongly to the increase in our license fee by 54% to the regulatory body, the NZ Post Office, without any success. So ZL amateurs will be paying more for the privilege of being able to operate on the ham bands from July this year, but I don't think the increase will have any detrimental effect on the hobby. I get a reprieve myself, as my license fee is not due until April next year, the anniversary of the date I received my amateur certificate in 1948.

A CHANGE AT THE TOP

At the NZART Annual Conference in Christchurch in June this year, retiring President Don Mackay ZL3RW handed over the gavel to incoming President Terry Carrell ZL3QL, and we of NZART look forward to an exciting period with him. Terry is an airline pilot, a businessman in electronics, and an enthusiastic amateur operator, interested in many facets of the hobby, including satellites and packet radio.

IARU REGION 3 CONFERENCE

Organization is well under way for this important international event to be held November 13–17 at the Rose Park Hotel in Auckland. Already papers have been received on a multitude of topics; the final selection of papers to be considered at the conference will rest with the NZART Council. At present the list of papers includes a report from NZART, information on preparation for the next WARC, the band at 10.1 MHz, international beacon projects, common licenses and international standards, the Region 3 Award, "Pirate Operators and Improperly Licensed Stations," "Misuse of Amateur Radio by Amateur Stations," "A Band Plan for the 28-MHz Band," "Standardizing on USB on all bands," and "Inexpensive Equipment for Developing Countries."

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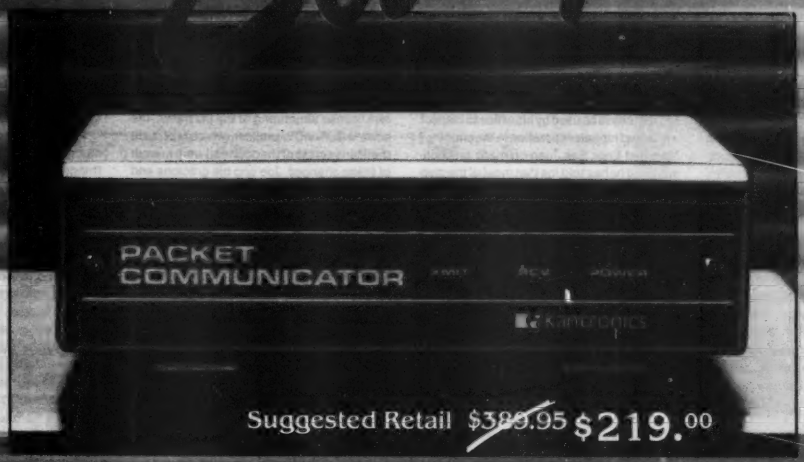

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countries at the conference. They will be granted a temporary amateur transmitting license for the period 10–30 November for VHF hand-held transceivers provided those representatives and delegates hold a current amateur license issued by their administration, even if that administration does not have reciprocal licensing arrangements with New Zealand. Representatives from countries that have reciprocal licensing arrangements with New Zealand will receive the normal privileges appropriate to the qualification they hold in the same way as they would with a normal application for reciprocal licensing arrangements.

To provide some distinctiveness for these special licensees, callsigns will be allocated from the series commencing ZL0ZAA. It will be the first time all representatives and delegates to an IARU regional conference have been licensed to operate on the bands, even though on a restricted basis. Indeed a unique occasion, a concession which should be important to the hobby as a whole, and a very convenient arrangement for the delegates and representatives from our overseas fraternities.

Special ZM Prefix

In recognition of the importance of this conference to ZL amateurs in general, the New Zealand Post Office has given approval for the use by licensed New Zealand amateur stations of the ZM prefix for the period 1 October 1985 to 31 December 1985 inclusive.

Special Conference Station, ZM6ARU

The operation of a special club station in association with the conference using the callsign ZM6ARU for the period 9–18 November was also approved by the ZL regulatory body.

PHILIPPINES

Leo M. Almazan WA6LOS/DU2
10098 Knight Drive
San Diego CA 92126

Hello again, everyone, I am back again in DU-land. Here is a belated report!

Before departing San Diego, I received three copies of *The Amateur Radio World* from DU5-land. It seems that this fine magazine is what the amateur-radio community in DU-land needs; it is informative and provides for the needs of the local ham population in both technical and general ham information.

I arrived Christmas Day and was whisked out of immigration and customs in record time. No hassle and no baggage check! What is more amazing is that I also made the 65-mile journey from the airport to Clark Airbase in record time. There was no traffic in sight! Guess I timed this one right.

I immediately went to 145.70 MHz to let the guys know that I was back in town. Dodo DU2CCK and Ralph KA6BBK/DW2 were there to greet me. I was told that our club-station license was up for renewal, which meant reinspection of the station and the station's log by inspectors from the National Telecommunications Commission. Yes, gang, this is done every year. Since I left, the club station (DX2F) was moved from the Carmelite Hospital to the present site at Dungca's Furniture Store, about a mile and a half away. Tony Dungca, who is awaiting his license to operate, has graciously let the club site be one of his unused offices.

The club station consists of an old Heathkit DX-20 transmitter and vfo and an ever-reliable Drake 2B as the station receiver. The HF antennas are multi-element dipoles for 40, 20, and 15 meters. For VHF, the club has a Yaesu FT-290 and a home-brew/hybrid repeater and various VHF antennas. The repeater was operational in 1983 but was out of service in the latter part of 1984 due to lack of spare parts. (Spare parts are hard to come by here in DU-land; they have to be ordered from the US, and sometimes it is easier to order it by asking anyone going to the States to buy the parts on their way back to DU-land!) The club is contemplating whether to buy or fabricate a duplexer so that only one antenna would be in use so that some of our repeater-related problems would be solved. (Any club or individual back stateside care to donate or sell a used one, by any chance?)

Speaking about repeaters, Engr. San Juan of the National Telecommunications Commission has drafted the mechanics of repeater regulations, frequency allocations, and procedures to be used by his office to inspect a licensed repeater operation in the country. I have met Engr. San Juan on many an occasion, and he has told me that most of the club repeaters in the country are "illegals." He added that most of them have filed applications but have not been inspected yet by his office—and until they have passed their inspection, they are not allowed to operate.

This year marks the 52nd anniversary of PARA (the Philippine Amateur Radio Association). The 22 radio clubs affiliated will be in attendance for a meeting at the Quezon City Sports Center. DU7DP, the incumbent president, has promised an afternoon and evening of the usual dinner/eyeball and also a meeting "about something." The "something" will be the much anticipated restructuring of the still-unresolved national organization. I would like to see solidarity rather than the PARA vs. PCARS debate. I believe that resolving this problem would foster not only solidarity among the DU hams but also get the wheels rolling for solving other important problems besetting Philippine radio amateurs.

Another thing to come out of the "Grand Eyeball": a proposal for a hamvention chaired by our indefatigable friend Raul Duque DU1QUE, who is also known in DU-land as Mister Repeater, for obvious reasons. The last hamvention was held in Metro-Manila in 1983. Raul and his dynamic group made it successful, and this one, to be held in Quezon City sometime in February, may be even more promising and exciting, to say the least. I guess DU1QUE has earned himself another title—this one being "Mr. Hamvention."

The informal Mabuhay net at 14.265 MHz was back again at 1400Z during the late spring and summer when atmospheric conditions were much better. But the favored time was usually around 2230Z, where WB5LBJ/DU6 and company were on frequency to accommodate anyone wishing to land a DU QSO.

DU1JMG THE BOUNCER

Jose Mari Gonzalez has been a ham since the late 1960s. He has been the president of the Philippine Amateur Radio Association twice in the past, and currently is the DU-land IARU Region III representative. Joe is very active in all facets of ham radio—satellite, RTTY, slow-scan, and DXing. He used to be an avid contester, but because of his recording business obligations, he is now just content with checking into the SEANET and the informal Mabuhay net. But when time permits, usually in the early daylight hours, Joe will occasionally work European DX, creating pileups for several hours.

DU1JMG has been instrumental in the current license structuring of the DU hams. The current DU/DV/DW prefixes (which represent the license class of the operator) were a result of these changes. Joe and his gracious and beautiful XYL often have entertained visiting overseas hams and often accommodated them in their home QTH. DU1JMG has been the unofficial and Official Observer of the DU airwaves, especially on 2 meters, where there are a lot of illegal operators. He can often be heard giving stern warnings to illegal intruders—hence the nickname, "The Bouncer."

Joe has been in the international limelight lately because of his technical expertise in audio and video technology. He has been retained by the court and commission investigating the assassination of Benigno Aquino, the opposition leader of the Philippines. His current testimony and video and audio enhancement of the many tapes made during the assassination by different press and wires services have contradicted the government position and explanations of the assassination.

POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

Fifty-five years have already passed since the General Meeting of PRAA took place on February 22, 1930. The meeting gathered 150 deputies representing 352 members of Polish radio amateur clubs. Among the delegates were a few licensed senders, and others were unlicensed senders and monitors. Promoter of the meeting was the Radiotechnical Institute. The first president of PRAA, not-long-ago-deceased Professor Engineer Janusz Groszkowski, was elected at this historic assembly. The General Meeting of Promoters was a second milestone of development of PRAA after the First Congress of Promoters of IARU in 1925, where a Polish delegation was present.

Sixty years of existence of ham sport in Poland were marked with good and bad times, but a continuous development of shortwave technique. Polish hams began their work on devices with triodes, and now some of them have at their disposal contraptions with microprocessors. They have tasted different operators' techniques: CW, AM, SSB, RTTY, SSTV, and establishing contacts by reflections from the moon and through artificial satellites.

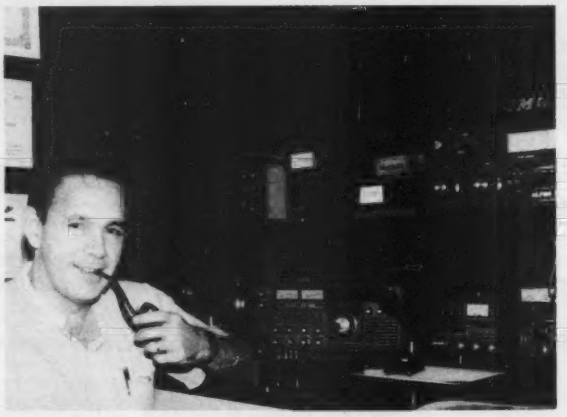
Polish radio amateurs have many remembrances of their activity, among other things priceless documents of the joint action with the Allied Nations during the Second World War. The district board of PRAA in Katowice as a first in Poland appointed an Historical Commission with an objective aimed at the compiling of documents and tokens of remembrance. Unfortunately, difficult housing conditions at PRAA headquarters in Warsaw hindered setting up a central museum until now. But nevertheless, a new history of Polish radio amateurs should be available in the future. To pay honor to the best Polish radio amateurs, the best clubs are to be given the names of these hams. The callsigns of famous Polish radio amateurs will not be awarded to anybody.

One of the most active and meritorious Polish hams, the vice-president of PRAA, Juliusz Schmidt SP3AUZ, died on October 27, 1984. He was a born ham, a DX-hunter. Among his numerous public initiatives we can call to mind was the SPDX Conference in Nowa Sol (his native town), organized by him.

So much history! Who will conduct this necessary and useful work next? There are already 5,050 licensed individual hams and 468 club stations in Poland. Among them are many hams engaged in research and development of this fantastic sport. The "Development Fund of Radio" has been set up lately. It will give financial aid to weaker clubs and promote investments.

Polish amateurs have taken part (or will) in the following international radio amateur contests this year:

1. SPDX Contest (CW) 6–7 April.
2. *CQ* WW WPX Contest (CW) 25–26 May.
3. *CQ* MIR (M) 11–12 May.
4. All Asian Contest (SSB) 15–16 June.
5. IARU Radiosport (M) 13–14 July.
6. WAE DX Contest (CW) 24–25 August.
7. All Asian DX Contest (SSB) 24–25 August.
8. WAE DX Contests (SSB) 14–15 September.
9. *CQ* WW DX Contest (SSB) 26–27 October.
10. *CQ* WW DX Contest (CW) 23–24 November.



Jose Mari Gonzalez DU1JMG, past president of PARA and currently the Philippine representative to IARU Region III.

PORTUGAL

Luis Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril 2765
Portugal

Hi!

This time we start with visitors in Lisbon. It is always nice when we have close encounters with old friends.

Last April, we had Frank Rose W1TIV

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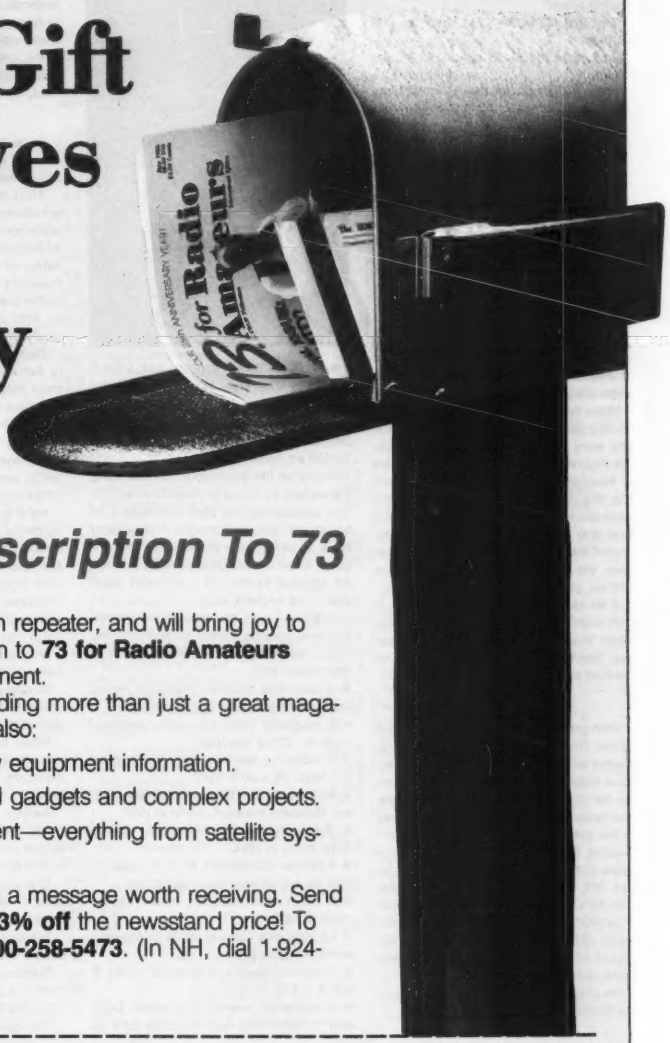

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65NR6

and his lovely wife, Irene, down here with us. We were very happy for that. Frank is an old friend and we've had a good meeting here. He is one of the few foreign hams who has talked to 466 Portuguese stations (381 cards received), with the following score:

Portugal (CT1/CT4)—244 contacts, 199 confirmed.

Azores Is. (CT2)—35 contacts, 30 confirmed.

Madeira (CT3)—14 contacts, 12 confirmed.

Angola (ex-CR6)—160 contacts, 87 confirmed.

Mozambique (ex-CR7)—59 contacts, 52 confirmed.

Cape Verde Is. (ex-CR4)—10 contacts, 8 confirmed.

S. Tome Is. (ex-CR5)—2 contacts confirmed.

And 1 confirmed contact each for Ex-Portuguese Guinea (ex-CR3), Timor Is. (ex-CR6), Goa Is. (ex-CR6), and Macau (ex-CR9).

Well, of course this is a big score for a foreign station, not to mention the dozens of awards he has around the walls, and some plaques too.

While in Lisbon, Frank and Irene visited some interesting places, met old friends, and were in the southernmost province, the Algarve, for a short visit. There is a lot of Moorish influence in architecture and folk dress as well as in Arabic words in the local dialect. They enjoyed the local cuisine, and loved the Portuguese sardines, anchovies, and other good dishes of that area. We loved having Frank and Irene with us, and we will wait for another trip.

If yours is a family of water sports, it isn't easy to find a better place for you. While there, ask for "medronho." However, don't drink too much or you will be the best singer in the world. (HI.)

SILENT KEY

With great regret we were informed that Jaime Gracias CT1OF, known as Jim, passed away last April. Graduated in Electrical Engineering, Jim was very active on the bands almost every morning. In amateur radio for many years, he was elected to the presidency of REP (Rede dos Emissores Portugueses) for about three years. Jim also managed the following duties: QSL manager for the Portuguese Bureau as well as VHF manager, a member of several working groups, and finally, a liaison officer for IARU. He always accepted all those duties with great respect and a sense of responsibility.

We shall miss hearing Jim calling CQ on the 20-meter band early mornings.

60 YEARS OF BROADCAST RADIO IN PORTUGAL

Celebrating the 60th anniversary of broadcast radio in Portugal, an exhibition was held last May in one of the new Post and Telecommunications buildings known as Forum Picoas, or Edificio das Telecomunicacoes, situated halfway between Saldanha and Marques de Pombal, opposite Lisbon's Sheraton Hotel (if that helps), the nearest tube station is Picoas.

Forum is just the finest thing we have connected with the Department of Telecommunications. It is a fine piece of architecture. There, several activities are held during the year; it is also used for congresses, mini-exhibitions, for demonstration purposes, general meetings, etc. Beyond all this, a complete media service might be used by the congress. The services are video projections, video recordings, translating machines, telex, phones, reprography, and a first-class secretariat. For break times, we have a coffee shop with superb meals.

Forum is open seven days a week, Monday to Friday 3:30 am to 1:00 am, and Saturday, Sunday, and holidays 11:30 am to 1:00 am (local time).

Frank Rose W1TIV sitting, and CT4UE. (Photo by CT4UE)

In one of the showrooms of this building we had a chance to observe an exhibition celebrating the 60th anniversary of broadcast radio in Portugal. In this event several antiques were shown, and we could recall the old days of radio activity. An updated version of a compact laser disk could be seen, too.

In a quick visit, we appreciated the following apparatus. I know, guys, that some of you would like to have these things in your shack. (HI.)

- A recording machine made by Presto Recording Corp., type GN series 01976.
- A magnetic horn for public address, made in 1930 (5 feet high).
- A recording machine made by Telefunken, mod. 79, sold in 1957.
- An old but nice Gramophonograph, Edison standard, model A, made in 1903.
- A Lioretgraphz phonograph, spring drive, made in 1894.
- A Philips microphone, N. 4210, made in 1930 (as big as your linear amplifier).
- A Stern radio receiver, model 2444g, made in 1929.
- Another nice receiver made by Murphy, series N. 256616.
- A real antique Scott receiver, series E 692, 5 x 4 ft.
- A crystal-set receiver WISI made, probably in 1935. (This was a simple form of receiving apparatus in the early days of broadcasting, using a crystal touching a metal wire as the rectifier.)
- A superheterodyne receiver made in 1929.

Well, it was an interesting event—just to remember the old days of the beginning of this century. Believe it or not, some of those wooden boxes were "portable." As a final comment, we saw a homemade receiver built in an empty ham can! This was made by CT1FT back in 1937.

ARCL

Once again, we are giving some more news of another association of radio amateurs we have, near Lisbon.

ARCL stands for Associacao de Radioamadores do Concelho de Loures. This association was founded January 27, 1983. At the time of this writing, 62 members are listed, all of them with a big amount of enthusiasm to carry on the several activities during the year. A few contests were made on VHF and HF, the last one with great success.

Back in 1983 they went on a DXpedition to Serra da Lousa (Lousa Hill), and from there they worked many stations on VHF and have made a 30-minute movie showing all the ham activity while on the Hill.

During this year a permanent award was issued known as Diploma Verde da ARCL, sent to all those who carry out the following rules:

Valid contacts with stations in the municipality of Loures using permitted ham frequencies in the following modes: CW, AM, and SSB, with different awards for each mode.

Contacts with mobile or portable stations will be valid, but only with hams living in that municipality.

Only contacts made after the 27th of January of 1985 will count for this award.

To apply, please send a certified list of contacts (list may be certified by a club station or three licensed radio amateurs).

When sending the logs, remember the operator's name, QTH, callsign, date of the contact, time (UTC), and transmission mode.

Awards will be sent free of charge for hams living in Portugal, Madeira, or Azores only. All the others, please include 4 IRCs for the mail charges.

Stations located in Portugal or Spain should make a total score of 15 points at least (see below).

Stations in other European countries should make 8 points.

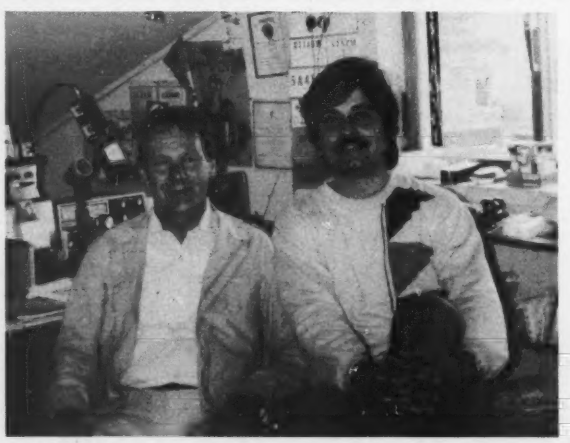
Stations from other continents: A minimum of 6 points is required.

For the SWLs, same as above.

The score is obtained according to the following: ARCL club station, when active, will give 4 points; any ARCL member will give 2 points, and nonmembers living in the same municipality will give 1 point.

Contacts with the same station will not be considered even if in a different band.

For any other info or when applying, send your request to ARCL, PO Box 148, 2677 Odivelas Codex, Portugal.



A visitor in Lisbon. Eberhard DL2MCM, left, with Mike CT4UE. (Photo by CT4UE)

REDE DOS EMISSORES PORTUGUESES

REP has presented its annual report, and we can pass on the following:

Rules: Several attempts were made for changes of a few matters, but they haven't reached any success. The talks between the local administration and REP haven't been very good, however REP's board of directors won't change a single word of the proposals presented for the ratification of the rules.

Due to the increase of the expenses, the membership fee has been increased, since January of this year. This decision was presented in the last General Assembly held in January, and agreed to by the meeting. The association has suffered, however, from delay of dues payments by some members. The total amount due is close to US$1,200.

Special attention was given to VHF and UHF repeaters. Some of these rigs, being worked on right now, will be highly improved for first-class operation in the future. The VHF/UHF repeater groups have been working on this project with great enthusiasm.

The QSL service is up date; distribution is handled as soon as packs are received from the post office. This is a volunteer basis job, and members might get their cards at REP's headquarters almost daily.

Very soon a General Assembly will be held, and among other agenda items will be an election of officers. More on this later.

PORTUGUESE TOP SCORES

The last news (January) tells us that the position of Portuguese hams in the DXCC, is as follows (numbers of countries): CT1FL—331, CT1BH—330, CT1UE—324, CT1RM—317, CT1UA—310, CT1XKA—305, CT3BM—265, CT2CE—253, CT4IB—251, CT4RH—223, CT4NH—219, CT2DF—203, CT2CQ—201, and CT1VY—200.

We were also happy to read that CT1FL is the 52nd ham who received the 5-Band WAZ! A hard job these days.

EDP CONTEST

A celebration of the 9th anniversary of the contest of the EDP (Electricidade de Portugal—the state company that supervises and supplies electricity to the whole country) was held last June, with the special call, CT5EDP. They were active on 40 and 80 meters, too.

VISITORS IN LISBON

Once again I've seen an old friend. Eberhard Schulz DL2MCM and part of his family came to Portugal for their summer holidays. Nice visit, but we almost got in trouble with the German beer that Eberhard brought to me as a gift. The stuff is really good, but in a matter of minutes, wow! HI! HI!

SWEDEN

Rune Wande SM0COP
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has got the Swedish ham population concerned.

The incident took place at a ham flea market. Representatives from Televerket (the National Swedish Telecommunications Administration = our FCC) were invited to show their mobile unit for sophisticated measurements in the radio field. They also invited flea-market visitors to get their 2m handhelds checked out for possible spurious emissions, etc. This was, so to speak, a public-relation event.

One fellow ham handed over his ICOM 2E to one of the representatives from Televerket, who also is a ham operator. (The E designator means that the unit is a version for the European market and covers 144–146 MHz.) It was noticed, however, that this particular unit was modified to cover 140 through 150 MHz—which is easy to do. Reasons for making this kind of modification could be, e.g., the wish to cover the whole band permitted, 144–148 MHz, with a reciprocal license during an upcoming trip to the USA, the wish to listen outside the ham bands, the intention of using the unit together with a transverter for 432 MHz in order to get proper coverage, etc. On the spot, in front of some twenty other fellow amateurs, this modified unit was confiscated and the owner's ham license immediately revoked for one year.

An unfortunate incident of this kind has been made possible since Televerket revised the amateur-radio regulations in 1981. Previously, a licensed radio amateur could possess any kind of a radio transmitter. It was also quite clear that transmitters capable of wide frequency coverage never should be used outside the authorized ham bands, and used only according to the user's ham license privileges. The changed regulation not only made tranamission outside the ham bands illegal (which of course was covered already by the old regulations), but also the *possession* of a transmitter not intended for amateur-radio use was made illegal.

After hard criticism, and realizing that the entire surplus market was closed for Swedish hams, Televerket issued a statement that a surplus transmitter has to be modified to cover only the ham bands within three months from date of purchase. It was also informally said that the intention of this new restriction was to be able to prosecute a licensed ham operator legally who uses illegal equipment and illegal power on the Citizens Band (CB).

Illegal use of the radio spectrum is of increasing concern to us as radio amateurs. We are, of course, in agreement with the licensing authority that illegal use has to be fought against. It is, however, very unfortunate and of much concern to us that the legal methods the authorities tend to use (compare the FCC ban for 20-MHz amplifiers in the USA) may severely restrict what amateur radio stands for, freedom for experiments, and exploration under responsibility.

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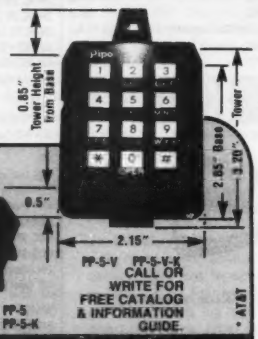

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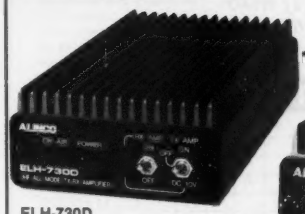

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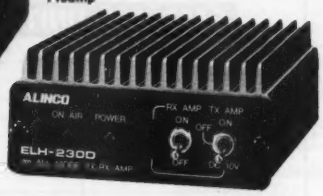

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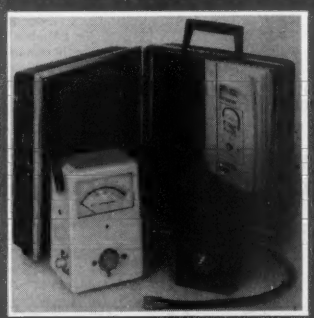

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ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40	40		20	15	15	15	15	
SOUTH AFRICA									15	15	15	
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JAPAN	20	20	20			40	40	40			20	20
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PHILIPPINES	15					40			20			
PUERTO RICO			20	20	20	20	20	20				15
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SUN	MON	TUE	WED	THU	FRI	SAT
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3 G	4 F	5 F	6 F	7 F	8 F	9 F
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Ramsey Electronics 79
73
- Back Issues 43
- Binders 69
- Dealer Ad 68
- Harold Stoner 55
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- Moving 83
- Subscriptions 16, 68, 81, 89

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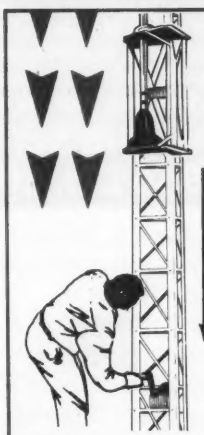

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With SMART PATCH You are in CONTROL

With CES 510SA Simplex Autopatch, there's no waiting for VOX circuits to drop. Simply key your transmitter to take control.

SMART PATCH is all you need to turn your base station into a personal autopatch. SMART PATCH uses the only operating system that gives the mobile complete control. Full break-in capability allows the mobile user to actually interrupt the telephone party. SMART PATCH does not interfere with the normal use of your base station. SMART PATCH works well with any FM transceiver and provides switch selectable tone or rotary dialing, toll restrict, programmable control codes, CW ID and much more.

To Take CONTROL with Smart Patch – Call 800-327-9956 Ext. 101 today.

What To Look For In A Phone Patch

The best way to decide what patch is right for you is to first decide what a patch should do. A patch should:

- Give complete control to the mobile, allowing full break in operation.
- Not interfere with the normal operation of your base station. It should not require you to connect and disconnect cables (or flip switches!) every time you wish to use your radio as a normal base station.
- Not depend on volume or squelch settings of your radio. It should work the same regardless of what you do with these controls.
- You should be able to hear your base station speaker with the patch installed. Remember, you have a base station because there are mobiles. ONE OF THEM MIGHT NEED HELP.
- The patch should have standard features at no extra cost. These should include programmable toll restrict (dip switches), tone or rotary dialing, programmable patch and activity timers, and front panel indicators of channel and patch status.

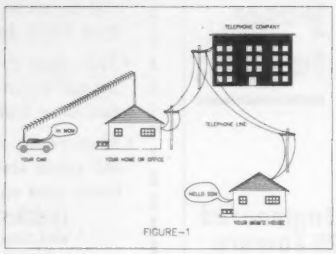
ONLY SMART PATCH HAS ALL OF THE ABOVE.

Now Mobile Operators Can Enjoy An Affordable Personal Phone Patch. . .

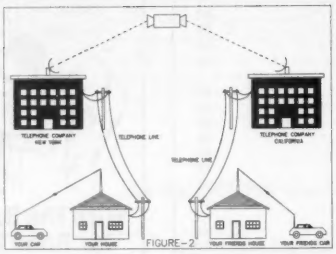
- Without an expensive repeater.
- Using any FM tranceiver as a base station.
- The secret is a SIMPLEX autopatch, The *SMART PATCH*.

SMART PATCH Is Easy To Install

To install *SMART PATCH*, connect the multicolored computer style ribbon cable to mic audio, receiver discriminator, PTT, and power. A modular phone cord is provided for connection to your phone system. Sound simple? . . . IT IS!



FIGURE–1



FIGURE–2

How To Use *SMART PATCH*

Placing a call is simple. Send your access code from your mobile (example: *73). This brings up the Patch and you will hear dial tone transmitted from your base station. Since *SMART PATCH* is checking about once per second to see if you want to dial, all you have to do is key your transmitter, then dial the phone number. You will now hear the phone ring and someone answer. Since the enhanced control system of *SMART PATCH* is constantly checking to see if you wish to talk, you need to simply key your transmitter and then talk. That's right, you simply key your transmitter to interrupt the phone line. The base station automatically stops transmitting after you key your mic. *SMART PATCH* does not require any special tone equipment to control your base station. It samples very high frequency noise present at your receivers discriminator to determine if a mobile is present. No words or syllables are ever lost.

SMART PATCH Is All You Need To Automatically Patch Your Base Station To Your Phone Line.

Use *SMART PATCH* for:

- Mobile (or remote base) to phone line via Simplex base. (see fig 1.)
- Mobile to Mobile via interconnected base stations for extended range. (see fig. 2.)
- Telephone line to mobile (or remote base).
- *SMART PATCH* uses SIMPLEX BASE STATION EQUIPMENT. Use your ordinary base station. *SMART PATCH* does this without interfering with the normal use of your radio.

WARRANTY?
YES, 180 days of warranty protection. You simply can't go wrong.
An FCC type accepted coupler is available for *SMART PATCH*.

CES®

Communications Electronics Specialties, Inc.
P.O. Box 2930, Winter Park, Florida 32790
Telephone: (305) 645-0474 **Or call toll-free (800)327-9956**

Celebrate your buying decision with the money you've saved.

When it comes to getting maximum HF performance for your dollar, the choice is clear. Yaesu's FT-757GX.

Nowhere else will you find so many HF features packed into one compact, mobile-ready package. At a price that's got the competition baffled.

For starters, each 757 includes an electronic keyer. 600-Hz CW filter. AM and FM modes. AF speech processor. And a 25-kHz marker generator. All at no extra charge.

And working the DX has never been easier with dual VFOs, single-button VFO/memory swap for split-frequency operation, eight memories, and push-button quick memory and band scan.

The 757 also lets you listen from 500 kHz to 30 MHz with its high-performance general coverage receiver. The transmitter covers 160 through 10 meters, including the new WARC bands, with 100 watts output on sideband, FM and CW.

CW buffs will enjoy the delights of full QSK operation. Plus the massive heatsink and duct-flow cooling system allow continuous RTTY operation for up to 30 minutes. Use the FP-757HD heavy-duty power supply option for continuous-duty applications.

And of course, there's the 757's highly attractive price. It's the perfect way to get all the HF performance you desire, with money left over to apply toward other ham gear. Perhaps a power supply for base station use. An antenna or antenna tuner. Or whatever else makes your operation complete.

So ask your dealer today about Yaesu's FT-757GX. The most celebrated HF price/performer on the air.

YAESU

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6851 Walthall Way, Paramount
CA 90723 (213) 633-4007

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton
OH 45011 (513) 874-3100

Prices and specifications subject to change without notice. Contact your Yaesu dealer regarding MARS operation.

KENWOOD

pacesetter in Amateur radio

The Smallest HT!

TH-21AT/31AT/41AT

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

- **High or low power.** Choose 1 watt high—enough to "hit" most local repeaters; or a battery-saving 150 mW low.
- **Pocket portability!** Kenwood's TH-series HTs pack convenient, reliable performance in a package so small, it slips into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and weighs 260 g (.57 lb) **with batteries!**
- **Expanded frequency coverage (TH-21AT/A).** Covers 141.000-150.995 MHz in 5 kHz steps, includes certain MARS and CAP frequencies.
  TH-31AT/A: 220.000-224.995 MHz in 5 kHz steps.
  TH-41AT/A: 440.000-449.995 MHz in 5 kHz steps.

- **Easy-to-operate, functional design.** Three digit thumbwheel frequency selection and handy top-mounted controls increase operating ease.

- **Repeater offset switch.**
  TH-21AT/A: ±600 kHz, simplex.
  TH-31AT/A: −1.6 MHz, reverse, simplex.
  TH-41AT/A: ±5 MHz, simplex.
- **Standard accessories:** Rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery pack, wrist strap.

NOW! Extended-life battery pack

- **Quick change, locking battery case.** The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.
- **Rugged, high impact molded case.** The high impact case is scuff resistant, to retain its attractive styling, even with hard use.

See your authorized Kenwood dealer and take home a pocketful of performance today!

Optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8** soft case for TH-21A/31A/41A
- **SC-8T** soft case for TH-21AT/31AT/41AT
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger

More information on the TH-series HTs is available from authorized dealers.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

TH-21AT and TH-31AT shown. Standard versions TH-21A/31A/41A without DTMF pad also available. Specifications and prices are subject to change without notice or obligation. Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.